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Interagency Committee on Ocean Pollution Research, Development, and Monitoring / Federal Coordinating Council for Science, Engineering, and Technology

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STAFF

Dail Brown, Claire Friedman, Lowell Martin, Barbara Pijanowski, and Shirley Selim
National Oceanic and Atmospheric Administration
U.S. Department of Commerce

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16. ABSTRACT Federal Plan No. 1 for Fiscal Years 1979-1983 is set forth in this report. The broad range of subject matter addressed by almost a thousand projects comprising the current $165 million Federal ocean pollution research, development, and monitoring effort is described. A comprehensive statement of national needs and problems based on public and private sector input is presented. A general overview of ocean pollution problems in the waters of the U.S. is provided and the adequacy of the current Federal response to these problems is analysed by problem area. Initial priorities are assigned to the research and development, and monitoring needs as identified. The needs, analyses, and priorities are synthesized into a set of initial programmatic and managerial recommendations which form the basis for a coordinated Federal effort to provide the knowledge and information necessary to deal with the most pressing aspects of the ocean pollution problem. Tasks are designed to implement these recommendations. (Sinha - OEIS)

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August 1979

Interagency Committee on Ocean Pollution Research, Development, and Monitoring / Federal Coordinating Council for Science, Engineering, and Technology

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Washington, D.C. 20230

THE ADMINISTRATOR

December 10, 1979

Dear Sirs:

It is my honor to submit the Federal Plan for Ocean Pollution Research, Development, and Monitoring, Fiscal Years 1979-1983, as required by the National Ocean Pollution Research and Development and Monitoring Planning Act of 1978, Public Law 95-273.

Sincerely,

Richard A Frank

Richard A. Frank

Enclosure

The President
President of the Senate
Speaker of the House of Representatives

PREFACE

In May, 1978, President Carter signed Public Law 95-273 -- the National Ocean Pollution Research and Development and Monitoring Planning Act of 1978 (the Act). The Act required that the Executive Branch --- "establish a comprehensive 5-year plan for Federal ocean pollution research and development and monitoring programs in order to provide planning for, coordination of, and dissemination of information with respect to such programs within the Federal Government."

Specifically, the Act requires the Plan to include a detailed inventory of existing Federal programs, an assessment and ordering of national needs and problems, an analysis of the extent to which existing programs assist in meeting these priorities, recommendations for changes in the overall Federal effort where necessary, and a report on budget coordination efforts.

The Act designated the Administrator of the National Oceanic and Atmospheric Administration (NOAA) as responsible for preparation of the Plan, in consultation with other Federal agencies having ocean pollution research, development, and monitoring responsibilities. An Interagency Committee on Ocean Pollution Research, Development, and Monitoring (Interagency Committee) which was empaneled by the Federal Coordinating Council for Science, Engineering, and Technology in the Executive Office of the President was responsible for most of the information gathering and analysis required in the preparation of the first Federal Plan.* Members of the Interagency Committee were as follows:

Department of Agriculture
Department of Commerce
Department of Defense
Department of Energy
Department of Health, Education, and Welfare
Department of the Interior
Department of Transportation
Environmental Protection Agency
National Aeronautics and Space Administration
National Science Foundation
Nuclear Regulatory Commission
Council on Environmental Quality
Office of Management and Budget**

This interagency process has already contributed significantly to the Federal ocean pollution coordination effort by improving the dialogue among the Federal employees involved in funding, managing, conducting, and using these projects and programs. This was a highly productive exercise. Some form of

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* A description of the procedures followed in implementing P.L. 95-273 is contained in Appendix A.

** Observer

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strong interagency involvement should be continued to ensure implementation of the first Federal Plan and an improved planning process for the second Plan.

Federal Plan No. 1 for Ocean Pollution Research, Development, and Monitoring, Fiscal Years 1979-1983, set forth in this report, includes the following elements, which are summarized in chapter I***:

Chapter II describes the broad range of subject matter addressed by almost a thousand projects comprising the current $165 million Federal ocean pollution research, development, and monitoring effort. (Required by Section 4(b)(2)(A) of the Act.)

Chapter III contains a comprehensive statement of national needs and problems based on public and private sector input. (Required by Section 4(b)(1)(A) of the Act). Chapter III also provides a general overview of ocean pollution problems in the waters of the United States and contains analyses, by problem area, of the adequacy of the current Federal response to these problems. (Required by Section 4(b)(2)(B) of the Act.)

Chapter IV assigns initial priorities to the research, development, and monitoring needs identified in chapter III. (Required by Section 4(b)(1)(B) of the Act.)

Chapter V synthesizes the needs, analyses, and priorities into a set of initial programmatic and managerial recommendations which form the basis for a coordinated Federal effort to provide the knowledge and information necessary to deal with the most pressing aspects of the ocean pollution problem. (Required by Section 4(b)(3) of the Act.) Chapter V also identifies tasks designed to implement these recommendations.

The summary of current Federal programs in chapter II identifies Federal resources devoted to ocean pollution research, development, and monitoring. However, the Act became law too late in 1978 for more detailed and extensive coordination of the Executive Branch budget review process for the 1980 and 1981 fiscal years, pursuant to Section 4(b)(4) of the Act. Appropriate budget coordination efforts will commence this fall for the fiscal year (FY) 1982 budget.

Federal Plan No. 1 is an important step towards achieving the purposes of the Act -- a sound Federal ocean pollution research, development, and monitoring program and the information base to support rational, efficient, and equitable decisions on utilization, conservation, and development of the Nation's ocean and coastal resources. If a concerted, conscientious effort is made over the first Plan period -- fiscal years 1979 through 1983 -- to follow through on the Plan's recommendations, the Nation should benefit significantly through improved decisionmaking with respect to ocean and coastal resource conservation, use, and development.

***A series of Working Papers will be published as supplements to the Plan. They are listed in Appendix B.

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CHAPTER I: SUMMARY OF FEDERAL PLAN NO. 1

Currently almost 1,000 individual federally conducted or federally sponsored projects relate to ocean pollution research, development, and monitoring. These efforts, representing an investment of $165 million by the Federal Government in FY 1978 alone, are underway in seven departments and four agencies. They often form a part of broader programs which have been developed by the departments and agencies in response to their own specialized legislative mandates and agency missions.

Individual agency missions range from environmental protection to national defense. In preparing Federal Plan No. 1, the Interagency Committee has come to recognize that there are inherent limitations on the capability of a planning process, such as that mandated by the Act, to accommodate the wide range of legislatively mandated missions of Federal agencies in meeting national ocean pollution research, development, and monitoring objectives. Because some missions are diverse and not always compatible, it is not possible to develop in specific detail a single rigid program which would direct all ocean pollution-related research, development, and monitoring activities. The most productive results can be obtained by setting goals and objectives which are or should be important to all ocean pollution programs regardless of agency, by identifying similar activities or support systems which could be coordinated, by resolving problems which are common to many projects, and by determining means to assure that critical knowledge gaps are addressed.

This first 5-year Federal Plan is therefore intended to give overall policy guidance to efforts to plan and coordinate the Federal activities related to ocean pollution research, development, and monitoring. Recognizing that individual agencies need flexibility and autonomy to respond to their own specific missions, it is the intent of the Federal Plan to encourage agencies to meet their own needs, to the maximum extent possible, within the context of an overall Federal direction and to develop mechanisms for linking together the many efforts which address the problem of ocean pollution.

To improve Federal planning and coordination, the Interagency Committee has formulated two major goals for the Federal effort:

1) To develop and provide the necessary base of environmental information to support rational, efficient, and equitable decisions about conservation, use, and development of the Nation's oceanic, coastal, and Great Lakes resources.

(2) To develop and provide assessments and predictions of the state of the marine, coastal, and Great Lakes environment that are relevant for use in protecting and managing such environments.

To assist in achieving these major goals, the Interagency Committee also formulated the following national objectives:

1) To identify, through a balanced program of Federal, state, local, and academic research, present and potential pollutants that are capable of having deleterious effects on marine ecosystems and human health; to determine the physical and chemical behavior of these pollutants and their transformation products; and to identify principal contaminant sources, pathways, and sinks.

2) To characterize the effects of pollutants and their products on the marine ecosystem, including acute, chronic, bioaccumulative, and synergistic impacts.

3) To develop the capability to anticipate future ocean pollution problems and to predict and assess the social, economic, and environmental impacts of marine pollutants, and to provide information for devising alternative strategies for regulation or ameliorative action.

4) To implement effective and efficient monitoring of the marine and coastal environment to detect in a timely manner the human-induced and natural changes in pollutant levels and the structure of ecosystems.

5) To provide the information necessary for regulatory and enforcement decisions on permissible exposure levels of pollutants for persons, marine organisms, and ecosystems.

6) To maintain and improve mechanisms for integrating and disseminating information on ocean pollution research, development, and monitoring so that decisionmakers and the public are informed on a timely basis.

7) To develop the information and procedures needed by scientists assisting in the Federal effort to mitigate the impact and assess damages to the environment of major pollution events where appropriate.

8) To assure that essential information is available so that high priority ocean pollution problems can be adequately addressed.

9) To continue support for research programs that deal with ecosystem processes and long-term effects of pollution, and require sustained effort to provide meaningful results to decisionmakers.

A. Current Federal Programs

Section 4(b)(2) of the Act requires that the Federal Plan include a detailed description of the existing Federal ocean pollution research, development, and monitoring effort. The major activities of the involved departments and independent agencies are described in Chapter II of Plan No. 1. Working Paper No. 1 provides a detailed project-by-project catalog of the current effort. This overall examination of existing Federal capabilities and activities shows that:

- The effort consists of nearly 1,000 projects funded at $165 million in FY 1978, with expenditures of $188 million projected for FY 1980.
- The Department of the Interior is the single largest funding agency, acocunting for 34 percent of the FY 1978 program, with the Environmental Protection Agency second at 21 percent and the Department of Commerce third at 11 percent.
- Approximately one-third of the Federal effort is directed at problems related to petroleum as an ocean pollutant.
- Sixty-five percent of the Federal effort is directed at specific causes of ocean pollution. Primary emphasis is on mineral, particularly oil and gas, extraction as a pollution source, followed by efforts focused on waste disposal and coastal land use practices.
- Sixty percent of the Federal program focuses on regional problems. Alaska and the Mid-Atlantic region receive major emphasis.
- Eighty percent of the Federal program is devoted to research on pollution problems. The remainder is divided almost evenly between operational monitoring and technology development efforts.

B. National Needs and Problems

An identification of national needs and problems related to specific aspects of ocean pollution is required by Section 4(b)(1)(A) of the Act. Chapter III of the Federal Plan discusses the results of extensive Federal and non-Federal participation in the development of statements of national needs and problems. A broad cross-section of Federal and non-Federal scientists participated in a workshop on scientific problems related to ocean pollution held in the summer of 1978. Numerous representatives of State and local government planning agencies, private industry, and environmental interest groups took part in a workshop on national needs and priorities for ocean pollution research, development and monitoring held in fall 1978.

Because of the complexity of the overall ocean pollution problem, these needs and problems discussions are presented from several perspectives:

- Effects of ocean pollution on human health, living resources, recreation and aesthetics, including statements of regional needs and problems.

- Activities that cause marine pollution.

- Tools for evaluating ocean pollution, including research, monitoring, technology development, measurement technology, quality assurance, and data and information management.

- Tools for controlling and minimizing ocean pollution.

The several hundred individual statements of ocean pollution research, development, and monitoring needs and problems set out in chapter III of the Federal Plan form the framework within which the priorities required by the Act were established. They reflect the many facets of the ocean pollution problem. For example, the discussion of the needs related to waste disposal identifies outfall discharges of muncipal sewage as an area of concern. That particular need and problem statement notes that the 1977 Federal Water Pollution Control Act Amendments require monitoring and evaluation of coastal municipal sewage outfalls for 5 years at outfalls that are exempt from secondary sewage treatment requirements, and discusses the research, development, and monitoring needs with respect to pollutant movement and alteration, synthetic organic pollutants, outfall monitoring, biostimulant research, sediments, microbial and biologically active pollutants, municipal waste treatment technology improvement, and monitoring strategies.

C. Initial Priorities

Each of the 11 departments and agencies involved in ocean pollution research, development, and monitoring activities currently sets its own priorities in the process of developing its budget submittal to the Office of Management and Budget. These priorities respond to the agency's legislative mandates, to executive branch priorities and initiatives, and to the necessity of satisfying other needs, such as those imposed by the National Environmental Policy Act or by legal proceedings.

Section 4(b)(1)(B) of the Act, however, requires that the Federal Plan treat ocean pollution as the primary concern in ranking the problem areas which should occupy the attention of the Federal program of ocean pollution research, development, and monitoring, and that the value and cost of information which can be obtained be used as a basis for determining priorities. This has been done in a qualitative way through use of the following factors in establishing the initial priorities of the Federal Program as discussed in Chapter IV:

- Immediacy of the pollution threat.

- Value and importance of the polluting activity to society and the economy.

- Distribution of the polluting activity, whether local, regional, or global.

- Value of the resources at risk.

- Likelihood of solving the problem in the near term, the availability of scientific expertise, and cost effectiveness.

In applying these factors to develop priorities in Plan No. 1, there was a tendency to emphasize the immediacy of the pollution threat. The Interagency Committee concluded that this approach is valid given the need to target financial resources and the potential risk to human health and living resources of present levels of ocean pollution. However, research, development, and monitoring activities relating to potential consequences of future marine activities and new technology should not be ignored, either in implementing Federal Plan No. 1 or in developing Federal Plan No. 2. Activity in these areas must be maintained at a level that will ensure that environmental information is available when needed for future decisionmaking.

The ocean and coastal zone uses and activities that generate ocean pollution and are of priority concern in the Federal ocean pollution research, development, and monitoring program have been grouped as follows:

High priority

Land use practices.
Outfalls of municipal sewage.
Disposal of industrial waste.
Disposal of radioactive waste.
Steam electric powerplants.
Disposal of dredged material.
Oil and gas.
Marine transportation.
Control and mitigation of pollution.

Medium priority

Deep seabed mining.
Mining of sand, gravel, and shell.
Ocean thermal energy conversion (OTEC).
Brine-producing activities.

Low priority

Sewage sludge dumping.
Effects of recreation.
Use of living resources.
Developmental ocean energy technologies.

This ranking is tentative and subject to change in Federal Plan No. 2. No attempt has been made to establish a relative ranking of the ocean activities within the high, medium, and low categories.

The initial priorities established in chapter IV are not intended to replace those of individual departments and agencies. Rather, they are intended to be used as guidance in assuring that all of the areas of most critical concern are addressed somewhere in the Federal effort, as the primary criteria for financial assistance to be made under Section 6 of the Act, and as an additional tool to be used in the evaluation of mission-related ocean pollution research, development, and monitoring activities.

D. Initial Analyses

Section 4(b)(2)(B) of the Act requires analyses of the extent to which existing programs meet, or will meet, priority national needs and will solve priority national problems. These analyses have proven to be more difficult to complete than initially anticipated by the Interagency Committee, because of the complexity of the ocean pollution problem and the multiplicity of scientific and technical disciplines that must be brought to bear to find solutions. However, chapter III includes an initial attempt at such analyses by problem area and integrates these analyses with the discussion of national needs and problems.

On the basis of these initial analyses, the Interagency Committee has concluded that the overall combination of existing projects and financial resource levels does largely address the major identified national needs and problems. But the Committee has also identified a number of pollution problems requiring additional attention in the Federal program. Several areas have been noted where there is a significant potential for overlap or duplication at the individual project level that merit further detailed analysis to achieve effectiveness and cost savings. The following Recommendations section discusses these areas.

The Interagency Committee has also concluded that major benefits to the Nation can result from improved linkages and interchanges between existing ocean pollution-related projects. The products of these projects would as a result be useful for more than one purpose by more than one type of user. This would provide additional information to the decision-making process and would result in a greater return on the Federal dollars spent on ocean pollution projects.

In addition to these general conclusions, the analysis has yielded a number of specific insights into means for improving the structure and content of the Federal program. These form the basis for the recommendations in chapter V of the Plan.

E. Recommendations

Section 4(b)(3) of the Act requires that policy recommendations be made for improvements in those areas where analysis shows that the present Federal effort will not adequately respond to priority needs and problems. These initial recommendations and the tasks necessary to implement them are set forth in chapter V and are summarized here. They cover both programmatic recommendations for improving the overall program as well as managerial and technical recommendations for changes in scientific and technical emphasis. The recommendations should be accomplished primarily within existing resource levels by shifting emphasis from lower priority activities and by more effective coordination and management.

1. Programmatic Recommendations

The analysis required to draw valid conclusions as to whether specific existing and planned projects will adequately address national needs and problems related to ocean pollution research, development, and monitoring has proved to be more extensive than initially anticipated by the Interagency Committee. In this first attempt to identify ways in which existing and currently planned projects can be brought together into a comprehensive, well-coordinated Federal program, such in-depth analysis has not yet been accomplished satisfactorily.

However, based on the recommendations of several workshops and subcommittee groups, the Interagency Committee has been able to identify broad areas in which a higher priority should be placed on the problem, as well as areas in which Federal projects should be examined in detail in order to facilitate improved coordination and more effective funding. These areas are discussed in detail in Working Papers Nos. 2-7.

a. Pollution Problems Requiring Additional Emphasis

A comparison of the inventory of Federal projects funded during FYs 1978, 1979, and 1980 with the priorities for the Federal ocean pollution research, development, and monitoring program set forth in chapter IV revealed several broad areas in which strengthened research, development, and monitoring efforts appear warranted:

(1) On problems related to the effects of pollution on human health, there appears to be a need for:

- Selected studies to determine the effects of microorganisms, synthetic organics, and biologically active transformation products
- Risk analyses to identify, evaluate, and rank potential hazards resulting from marine pollution

(2) On problems related to the effects of pollution on living resources, there appears to be a need for:

- o Identification of biological control factors that are particularly sensitive to pollutants within the ecosystems
- o Use of impacted areas to identify effects of pollution by characterizing changes in natural areas and recovery rates of impacted areas
- o Identification of critical habitats of marine animals, sea birds, and marine endangered species that are most vulnerable to pollution threats

(3) On problems related to the effects of pollution on recreational resources, there appears to be a need for:

- o Estimates of the potential value loss to marine recreation from pollution, particularly petroleum, synthetic organics, and pathogens
- o Regional surveys of the availability of and demand for marine recreational resources, including estimates of their value to society

(4) On problems related to coastal land use practices, there appears to be a need for:

- o Inventories of upstream sources of ocean pollution
- o Studies of estuarine pollution loads
- o Models of regional coastal pollutant flux
- o Information to formulate guidelines for coastal facility site selection
- o Studies to determine impact of multiple facilities

(5) On problems related to municipal sewage outfalls, there appears to be a need for:

- o Data on pollutant movement and alteration
- o Monitoring strategies

(6) On problems of industrial waste disposal, there appears to be a need for:

- Studies of synthetic organic pollutants, metals, and inorganic chemicals
- Monitoring of industrially polluted environments

(7) On problems related to oil and gas, there appears to be a need for:

- Studies of long-term low-level effects of chronic discharge from multiple sources
- Assessments of damage from oil spills

(8) On problems related to spill cleanup and response, there appears to be a need for:

- Better definition of harm
- Classification of shoreline vulnerability

(9) In certain geographic regions, there appears to be a need for work on problems related to:

- Environmental monitoring
- Studies of nonpoint-source pollutants
- Studies of point-source ocean outfalls
- Studies of the effects of multiple source pollutants on sensitive habitats
- Studies of the fates and effects of pollution from diffuse sources, including the sources, fates, and effects of toxic organic materials, with special emphasis on concentrations in sport and commercial fish and potential hazards to human health

The areas which have been identified above should be addressed largely through reprogramming and more effective use of existing financial resources in the Federal program as follows:

Task 1: A systematic review of Federal mission agency and state/local government roles should be conducted to identify appropriate Federal and non-Federal government entities to address identified problem areas. Where necessary, appropriate mission agencies in the Federal Government should develop program initiatives in these areas and seek funding through changes in program emphasis or reprogramming; State and local authorities should be encouraged to review their activities in these areas to determine if they are adequate and appropriate to fill gaps in the Federal effort and to address regional problems where appropriate.

b. Ongoing Projects Requiring Analysis

While the Interagency Committee has not been able, at this stage in the first planning process, to make specific proposals for cooperation between Federal agencies in specific program areas, an analysis of the inventory of Federal projects has concluded that there is significant potential for overlap or duplication at the individual project level in several broad areas:

- Studies related to petroleum and petroleum products
- Studies to define environmental baselines and pollutant distributions
- Studies on fates and effects of hazardous materials, particularly persistent synthetic organics
- Studies to develop transport models including airborne transport of pollutants into the marine environment
- Studies to develop bioassay and microcosm methodologies
- Studies to develop standard methodologies for monitoring, data management, and quality assurance.

Each of these areas should be analyzed in detail to determine if specific proposals for increased coordination as called for in Section 4(b)(3)(C) of the Act could be implemented to bring about more efficient and effective overall performance without compromising critical agency missions. Recommended actions in addition to the review proposed in Task 1 are as follows:

Task 2: A systematic review of Federal mission agency and state/local government programs in these areas should be conducted. This review should include identification of each agency's mission and mandate in the area; an evaluation of agency expertise in the area; a thorough definition of the goals, techniques, resources and equipment, geographic areas of interest, and management implications of each project; a search for gaps that could be filled or problems that could be solved by cooperation between agencies; and a search for overlapping or duplicative efforts that could be eliminated.

Task 3: Development of a report on the status of each subject area, including the state of the technology, available information, and unanswered questions. This report would be used as a measuring stick in evaluating the overall Federal effort in the area. On the basis of that evaluation, alternative approaches for improving effectiveness and efficiency in these areas would be developed, ranging from simple publication of a report spelling out the information gained as a result of the in-depth review to detailed proposals for legislative action.

2. Managerial and Technical Recommendations

The Federal Plan's management and technical recommendations are directed at interdisciplinary problems that require a broad range of managerial and technical actions.

a. Research

An effective, coordinated research program forms the cornerstone of Federal efforts to develop the information base necessary for use by decisionmakers. Several broad research concepts that cut across many disciplines should be emphasized in planning future programs. Recommended actions are as follows:

Task 4: Assure that long-term studies on natural ecosystems not impacted by human activities are begun by appropriate Federal agencies.

Task 5: Foster development of an improved Federal capability to assess the economic and social impacts of pollution in order to develop information needed for pollution control decisions.

Task 6: Assure that efforts are continued to develop a basic understanding of physical and chemical oceanic processes necessary to support pollutant behavior and effects studies.

Task 7: Improve the ability of Federal research, development, and monitoring programs to identify new and potential ocean pollutants and predict their effects before problems become acute or damage to the environment is irreversible.

b. Monitoring

Monitoring of pollutant inputs, marine ecosystems, food resources, and assessing the effects of spills of oil and hazardous materials are vital to an effective Federal program. Recommended actions are as follows:

Task 8: Establish an interagency working group with a formal charter and work plan to develop an effective and efficient National ocean pollution monitoring plan for inclusion in the 1981 Federal Plan. The development of the monitoring plan should include an assessment of all existing federally funded ocean pollution monitoring programs and should take account of state managed ocean pollution monitoring programs.

Task 9: The interagency working group established in Task 8 will ensure that the National ocean pollution monitoring plan includes a mechanism for integrating existing monitoring data and information systems so that all relevant monitoring data and information is available to users. The plan should also include a means for converting monitoring data and information into forms useful in making decisions on ocean pollution control.

c. Technology Development

Technology development efforts are needed to support all facets of a comprehensive national program of ocean pollution research and monitoring. Many of these efforts will yield technology applicable to a variety of research areas and will result in the availability of equipment necessary to clean up and recover numerous toxic pollutants. Recommended actions are as follows:

Task 10: Foster expanded interagency effort to develop improved cleanup technology for spilled hazardous materials. This initiative should be coordinated by the National Response Team. Development of technology in this area should rely on involvement of private industry to the maximum extent practicable.

Task 11: Assure that efforts at the Federal level to develop techniques for assessing the environmental protection aspects of offshore oil operations, and storage and transfer facilities for oil and hazardous materials are coordinated and expanded where necessary.

d. Measurement Technology

Lack of adequate measurement capability is frequently the limiting factor in developing meaningful information about ocean pollution problems. Increased automation and the provision of better tools for use in monitoring and assessment could increase efficiency in this area. Recommended actions are as follows:

Task 12: Evaluate research and monitoring program requirements, including measurements of interest, precision, and measurement frequencies, and recommend improvements in measurement technology to meet established requirements.

Task 13: Encourage development of required sensors, equipment, techniques, and methods though the initiation of cooperative development agreements between interested agencies; the identification of high-priority development needs for private sector investment; and pooling of resources by appropriate funding organizations.

Task 14: Encourage standardization of equipment and techniques for operational monitoring programs whenever possible.

e. Quality Assurance

As used here, quality assurance has two aspects:

- Assurance that relevant data produced from research and monitoring is correctly stored and disseminated, along with relevant information on methodology, accuracy and error bounds
- Assurance that standard, accountable methods for sample collection and analysis are properly used in monitoring

The data handling aspect of quality assurance is vital to ensuring that the results of research and monitoring are useful to users. Accountability in sample collection and analysis is essential for guaranteeing that monitoring information can be of use in legally defensible regulatory programs and of use to persons other than the original data collector. Recommended actions are as follows:

Task 15: Establish an interagency working group with a formal charter and work plan to develop a coordinated marine data quality assurance program plan for all federally funded ocean pollution research and monitoring activities. This plan, which will form a part of the 1981 Federal Plan, should address the need for compatible reporting formats and for correctly storing and disseminating data, along with relevant information on methodology, accuracy, and error bounds. This effort should be recognized in the National Ocean pollution monitoring plan to be developed by the interagency working group described in Task 8. It is not the intent of this plan to constrain innovative research. As the Council on Environmental Quality (CEQ) is also pursuing problems of data quality assurance in government research and monitoring programs, the working group established under this task should closely coordinate their efforts with those of CEQ.

Task 16: The interagency working group should also ensure that broad quality assurance guidelines and minimum requirements for all federally funded ocean pollution monitoring programs are included in the plan. These guidelines should include specifications for use of appropriate handbooks, standard methods and equipment, laboratory and field testing, calibration, and intercalibration procedures. Where such tools do not exist, their development should be called for in the plan. All relevant federally funded monitoring programs should be required to adhere to the minimum standards set in the guidelines, and all agencies should be required to establish their own monitoring quality assurance programs conforming to the guidelines.

f. Data and Information Coordination and Dissemination

Under Section 8 of the Act, NOAA is required to assure dissemination of research results to user groups. Achieving compatibility between the existing data and information systems of the Federal agencies involved would result in substantial benefits to users of ocean pollution information. However, such action is not possible without the cooperation and support of all agencies conducting ocean pollution projects. Recommended actions are as follows:

Task 17: Organize an interagency working group to advise on (1) coordination of the network of existing data centers by encouraging the use of standardized formats and reporting procedures to assure that data collected through ongoing programs can be more efficiently used for multiple purposes, and on (2) development of a centralized capability to analyze, organize, and present data and documentary results by coordination of information from diverse agencies into present state-of-knowledge reports on pollutants, sources of pollution, and the health of the environment in various geographic regions. Recommendations should be included for cost sharing by benefitting Federal and non-Federal programs. As the Council on Environmental Quality has an existing Environmental Data and Monitoring Task Force, this work should be coordinated or combined with the efforts of that group.

Task 18: Inventory non-Federal programs of ocean pollution research, development, and monitoring on a regional basis and combine this information with the catalog of Federal programs that has been developed during implementation of the Act. This will provide a more comprehensive basis for analyzing the adequacy of Federal activities in responding to overall needs.

g. Multidisciplinary Workshops

In most instances, the results of research, development, and monitoring activities are communicated most effectively to peers in the same or similar disciplines and, somewhat less effectively, to decisionmakers in the Federal government. However, results are seldom communicated in a timely and effective manner to the full range of professionals concerned with ocean pollution across disciplinary and agency boundaries. Carefully planned, managed, and documented information exchange workshops bringing together representatives of various scientific disciplines, as well as government decisionmakers, could improve this situation.

Task 19: Organize selective multidisciplinary forums, conferences, and workshops at both the national and regional level where definite benefits can be achieved. These efforts should bring together scientists and decisionmakers concerned with specific ocean pollution problems. They should lead to integration of current knowledge with the results of past studies, interpretation of project results, and publication of up-to-date statements of relevant available information on specific problems.

F. Implementation and Planning Responsibilities

NOAA, as the lead agency designated in the Act, and the other departments and agencies involved in Federal ocean pollution research, development, and monitoring must continue to work together to meet the goals established by the Interagency Committee. This section identifies actions which must be undertaken to proceed with implementation of the recommendations of Federal Plan No. 1 and development of Federal Plan No. 2.

1. NOAA Responsibilities

NOAA has primary responsibility for preparing the 5-year plan (Section 4 of the Act), establishing a comprehensive agency ocean pollution program (Section 5 of the Act), providing financial assistance for research and development and monitoring activities (Section 6 of the Act), and ensuring that the results of Federal research, development, and monitoring programs are disseminated in a useful and timely manner (Section 8 of the Act). Recommended actions are as follows:

> Task 20: Establish a National Marine Pollution Program Office at a high level within NOAA to assist NOAA and the other agencies in carrying out the Act and the recommendations in the Federal Plan. Part of the staff of this Office should be full time representatives of the other principal agencies involved in ocean pollution research, development, and monitoring. The National Marine Pollution Program Office, as staff to the chairman of the Interagency Committee on Ocean Pollution Research, Development, and Monitoring, will assist the chairman and committee in ensuring implementation of the recommendations of the Federal Plan and preparing future Federal Plans.
>
> Task 21: Develop clear guidelines for implementation of Sections 5, 6, and 8 of the Act within NOAA. These guidelines should place responsibility for specific sections of the Act and explain how NOAA will ensure that its ocean pollution activities are consistent with the Act.

2. Other Agency Responsibilities

Section 7 of the Act requires all Federal departments or agencies engaged in ocean pollution-related activities to cooperate with NOAA in implementation of this Act. Section 4(b)(3) requires efforts to coordinate the budget review process with respect to ocean pollution research, development, and monitoring. At this time, each agency, including NOAA, should make a commitment to undertake the following four activities that are fundamental to the future success of the Federal planning effort:

> Task 22: Establish the present Interagency Committee on Ocean Pollution Research, Development, and Monitoring as the policy level interagency group responsible for implementing the National Ocean Pollution

Research and Development and Monitoring Planning Act of 1978 (Public Law 95-273). The National Marine Pollution Program Office established under Task 20 will act as staff to the Chairman of the Interagency Committee as the Committee carries out this role.

Task 23: Develop a multiyear prospectus for ocean pollution research, development, and monitoring activities within the agency. This prospectus should reflect the agency's consideration of Federal Plan No. 1 and should be used in developing future Federal Plans.

Task 24: Assure that agency plans which focus on specific mission requirements and individual budget concerns are, to the maximum extent practicable, consistent with Federal Plan No. 1 and with future Federal Plans.

Task 25: Cooperate with the Chairman of the Interagency Committee in developing a coordinated budget review process, as required by the Act, for assuring that individual agency and overall Plan priorities are reviewed and coordinated in a systematic fashion.

G. Conclusions

The process of gathering and analyzing the data for Federal Plan No. 1 has been an intense learning experience for all of the involved departments and agencies. Preparation of the Federal Plan has been hampered by a tight time schedule and by difficulties in developing detailed information on existing Federal efforts. However, the interagency process has been a productive exercise and has already contributed significantly to the Federal coordination effort.

Work must begin immediately on the first revision of the Federal Plan mandated by Congress, which is due on February 15, 1981. Experience gained in preparing the first Federal Plan indicates that efforts should be focused on improvement of specific areas of the Federal Plan, while at the same time improving the overall quality of the document. Therefore, emphasis will be placed on (1) integrating into the Plan an improved understanding of agency missions, legislative mandates, and scientific and technical strengths, thereby allowing for recommendation of lead agencies to address specific problem areas; (2) accomplishing an in-depth analysis of Federal efforts in research, development, and monitoring in a specific area (such as petroleum pollution, which accounts for approximately one-third of the current Federal effort); and (3) improving the process of cataloging Federal ocean pollution research, development, and monitoring programs and evaluating non-Federal activities. These efforts, coupled with attention to updating and improving the overall Plan, will yield a much improved tool for effective coordination of the Federal effort to respond to national ocean pollution research, development, and monitoring needs and problems.

CHAPTER II: SUMMARY OF FEDERAL AGENCY PROGRAMS

The Federal funding for ocean pollution research, development, and monitoring was $164,736,000 in fiscal year 1978. Projected funding levels for FY 1979 are $161,785,000 and for FY 1980, $188,388,000. The Federal Program involves 11 Federal agencies. In the order of their funding levels in FY 1978, the agencies are:

Department of the Interior
Environmental Protection Agency
Department of Commerce
Department of Energy
National Science Foundation
Department of Transportation
Department of Defense
Department of Health, Education, and Welfare
National Aeronautics and Space Administration
Nuclear Regulatory Commission
Department of Agriculture

Of the total Federal Program budget, 75 percent was funded for four mission-oriented agencies: Department of the Interior (DOI), Environmental Protection Agency (EPA), Department of Commerce (DOC), and Department of Energy (DOE). Table 1 gives agency funding levels for FYs 1978, 79, and 80.

Table 1.--Federal Ocean Pollution Research, Development, and Monitoring Programs

	FY 78	FY 79	FY 80
		Thousand dollars	
Department of the Interior	$56,392	$52,556 *	$76,519
Environmental Protection Agency	34,989	36,426	40,407
Department of Commerce	17,538	19,818	24,711
Department of Energy	15,670	16,876	15,227
National Science Foundation	15,534	15,006	13,655
Department of Transportation	8,803	8,448	5,991
Department of Defense	8,802	7,321	6,565
Department of Health, Education, and Welfare	3,898	3,733	3,583
National Aeronautics and Space Administration	1,750	531	650
Nuclear Regulatory Commission	1,245	955	965
Department of Agriculture	115	115	115
	$164,736	$161,785	$188,388

*$7,700K supplemental fiscal year 1979 funds approved in August, 1979; this information received too late to be incorporated in subsequent analyses.

Agency summaries describe funded ocean pollution related programs and activities. Major applicable authorities -- legislation, Executive orders, reorganization plans, and Office of Management and Budget determinations -- that are the mandates for these activities are identified. Agency summaries are arranged by funding levels.

A. Department of the Interior (DOI)

The Department of the Interior accounted for 34 percent of the Federal budget with $56,392,000 spent in FY 1978. This is expected to increase to $76,519,000 by FY 1980. The DOI budget for FY 1978-80 is summarized below.

	FY 1978	FY 1979	FY 1980
		Thousand dollars	
Bureau of Land Management	37,656	30,085 *	51,185
Geological Survey	16,107	19,772	23,115
Fish and Wildlife Service	2,629	2,700	2,219
TOTAL	56,392	52,557	76,519

*See footnote to table 1.

Within the Department of the Interior (DOI) three agencies carry out ocean pollution research, development, and monitoring activities -- the Bureau of Land Management (Division of Offshore Resources), U.S. Geological Survey, and U.S. Fish and Wildlife Service. Statutory authorities for DOI activities include the Outer Continental Shelf (OCS) Lands Act of 1953 (which established Federal jurisdiction over submerged lands of the continental shelf seaward of State boundaries), the OCS Lands Act Amendments of 1978, and such other authorities requiring mandatory compliance as the National Environmental Policy Act (NEPA) of 1969, Coastal Zone Management Act of 1972, Federal Water Pollution Control Act of 1972, Marine Mammal Protection Act of 1972, Endangered Species Act of 1973 and Marine Protection, Research, and Sanctuaries Act of 1973.

The Bureau of Land Management (BLM) is the administrative agency for leasing submerged Federal lands. In this role, BLM is directed to provide for orderly development of OCS oil and gas resources to meet the energy needs of the Nation, and to provide for protection of the environment concomitant with development of mineral resources, which also include hard minerals such as sand and gravel. BLM-funded research accounted for 67 percent of the FY 1978 DOI budget of $56,392,000. Protection of the marine and coastal environment is a direct outgrowth of NEPA. The OCS Lands Act Amendments of 1978 imposed the requirement for Environmental

Impact Statements and led to BLM's Environmental Studies Program, which provides information needed to predict, assess, and manage any Outer Continental Shelf and nearshore development that might affect the human, marine, and coastal environments.

The U.S. Geological Survey (USGS) serves Federal, State, and local governments, and the public, by collecting, analyzing, and publishing detailed information about the Nation's energy, mineral, land, and water resources. Although created in 1879 to study geologic structure and mineral resources, Congressional and Executive directives have expanded the Survey's authorities and responsibilities to include topographic mapping, chemical and physical research, stream gauging and water supply assessments, supervision of mineral exploration and development activities on Federal and Indian lands, engineering supervision of waterpower permits, and administration of a mineral exploration program. Ocean-pollution related research and development and monitoring programs are carried out by the Geologic Division, Water Resources Division, and Conservation Division.

The Geologic Division conducts geologic research and investigation programs as a background for many economic and social decisions, and to better understand natural processes that influence our lives. Geologic programs involve four main fields of activity; land resource surveys, mineral resource surveys, energy resource surveys, and offshore geologic surveys. Offshore surveys assess the potential mineral and energy resources of the continental margins and include studies to determine the geological and environmental hazards that may affect offshore development.

The Water Resources Division of USGS has the principal responsibility at the Federal level for appraising water resources, for providing hydrologic data on surface and ground water, and for satisfying water information needs at all levels of government. The Division's Federal-State Cooperative Program includes 597 State and local agencies that provide financial support and services, with matching funds appropriated by the Congress. The Division keeps the Federal Government aware of State and local problems and contributes to a valuable exchange of information through a network of offices in all 50 States and Puerto Rico and Guam. In 1964, USGS was designated the lead agency for coordinating water data acquisition activities of all Federal agencies, including acquisition of information on streams, lakes, reservoirs, estuaries, and ground water. This activity minimized duplication among Federal agencies and has improved the data base and its accessibility. A growing component of the USGS program is the monitoring of coastal rivers and aquifers which provides information on the chemical and biological contributions to estuaries and the oceans.

The Conservation Division performs regulatory functions under laws governing leasing, mining, and use of mineral and water resources on Federal and Indian lands. It supervises operations associated with the exploration, development, and production of minerals from leased Federal, Indian, and Outer Continental Shelf lands, including the collection of royalties and certain rentals that result from mineral production.

The hydrocarbon resources of specific tracts on the OCS proposed for lease are evaluated to ensure that the Government receives fair market value for leasing and to ensure that only those tracts are offered for lease whose development can be accomplished in an environmentally acceptable manner. This includes tract-specific and site-specific identification and evaluation of geologic hazards that may affect offshore development, including the siting of drilling rigs and production platforms. Regulation of OCS oil and gas activities is a continuing process requiring constant review of program components and objectives, and can become more complex as production activities are undertaken in hostile new environments.

The U.S. Fish and Wildlife Service (FWS) is involved in environmental research and operational activities under mandates derived from the National Environmental Policy Act (NEPA), the Fish and Wildlife Coordination Act, and other Federal legislation. Three interrelated FWS programs deal with environmental issues. The Land and Water Resource Development Program, managed through the Division of Ecological Services, provides ecological input to field-level planning related to specific river basin studies and projects to be constructed by Federal agencies, assisted with Federal funds, or constructed by non-Federal entities under a Federal license or permit. The Ecological Services Division assures FWS compliance with NEPA.

The Environmental Contaminant Evaluation Program conducts research, monitors contaminants, and makes field appraisals to ascertain the effects of pesticides, industrial chemicals, heavy metals, and pollutants on fish, wildlife, and their habitats. It manages and reviews all FWS uses of pesticides and is directed toward determining relations between the application of pesticides and damage to fish and wildlife.

The Biological Services Program was created to assess impacts of new land and water development more rapidly and to keep abreast of projects related to energy, impairment of wetlands, and proposed changes in land and water use. This program is the coordinating link between FWS field operations and research and management activities. It supports research and studies on critical environmental problems, prepares guidelines and manuals, and provides technical assistance to help FWS participate in the decisionmaking process on major resource development projects. Through the program FWS advises BLM and the USGS on ecological problems associated with development of oil and gas resources on the outer continental shelf, including the least damaging ways to bring oil and gas ashore and the best locations for shore-based facilities. FWS is identifying critical zones that should not be developed and is analyzing alternatives to preserve critical areas while projects are in an early planning stage and options are still available.

B. Environmental Protection Agency (EPA)

The second largest portion of the Federal Program is accounted for by EPA, which funded 21 percent of the total fiscal year 1978 program.

EPA's FY 1978 budget was $34,989,000 and is expected to be $40,047,000 by FY 1980. The EPA budget for FY 1978-80 is summarized below.

	FY78	FY79	FY80
		Thousand dollars	
Health Effects (HERL/Cincinnati)	$ 619	$ 676	$ 550
Pollutant Transport (ERL/Athens)	6	6	0
Oil and Hazardous Materials Prevention and Cleanup Research (IERL/Cincinnati)	3,058	2,334	2,330
Great Lakes (ERL/Duluth)	3,722	3,766	3,689
Marine Ecology (ERL/Corvallis)	1,666	1,422	1,475
Marine Ecology (ERL/Gulf Breeze)	5,300	6,987	10,089
Marine Ecology (ERL/Narragansett)	4,577	4,376	5,200
Chesapeake Bay Studies	5,353	4,900	4,900
EPA Energy/Environment Interagency Program			
NOAA/DOC	2,195	2,315	2,950
NIEHS/HEW	180	180	250
FWS/DOI	900	900	650
NBS/DOC	100	100	-
DOE	240	242	-
DOE Transfer to EPA	-	864	864
Great Lakes National Program	3,728	3,728	3,200
National Water Quality Monitoring Programs	1,300	1,300	1,300
Evaluation of Radioactive Waste Dumpsites (ORP)	545	830	900
Ocean Dumpsite Evaluation Program (OWHM)	1,500	1,500	1,700
TOTAL	34,989	36,426	40,047

NOTE: Budget figures given for laboratories (ERL's) represent the total laboratory budget assignable to marine research and includes overhead, support services, etc., that are not necessarily reflected in reported individual project costs.

The Environmental Protection Agency (EPA) involvement in ocean use policy and management derives from the Federal Water Pollution Control Act as amended by the Clean Water Act, the Marine Protection, Research, and Sanctuaries Act, the National Environmental Policy Act, the Rivers and Harbors Act, and U.S. legislation implementing international treaties and agreements. EPA uses a variety of regulatory strategies to implement these mandates including water quality criteria, Federal discharge criteria, guidelines for private and governmental ocean use activities, and permits for certain activities, such as point-source waste discharges.

EPA regulations are prepared by program offices and reviewed by an Agency Steering Committee composed of all program offices: Office of

Water and Hazardous Materials, Office of Toxic Substances, Office of Enforcement, Office of General Counsel, and Office of Research and Development. The review considers such aspects as scientific validity, legality, enforceability, and consequences with respect to economic policy. Regulatory activities include classifying compounds or materials as hazardous substances, which, when spilled or discharged into marine waters, require specific cleanup actions, and can result in penalties on the discharger.

EPA permit activities are concerned with coastal development and recreation, especially the siting of powerplants and refineries, dredging and filling activities, and recreational water quality. EPA-issued permits can stipulate special requirements, such as review of waste treatment plans and schedules and monitoring at disposal sites.

Waste disposal activities are a primary responsibility of EPA. They include ocean dumping, incineration at sea, ocean outfalls, and riverine pollution. Main types of waste are sewage sludge and other municipal waste, industrial waste, radioactive waste, atmospheric and land nonpoint-source waste, and dredged material.

EPA shares some regulatory responsibilities with other Federal agencies such as the Corps of Engineers, which issues permits for disposal of dredged materials in navigable waters in accordance with EPA-prepared guidelines. It also acts in an advisory capacity to BLM relative to leasing arrangements on the outer continental shelf. An operational function within EPA's regulatory responsibility is to review permits and to advise and assist States and municipalities as they establish and maintain programs of coastal and marine management. Through such functions as the Municipal Construction Grants Program, EPA can influence specific activities, such as the degree of treatment required for municipal sewage discharged via outfalls.

Enforcement responsibilities generally are left to the States. Federal intervention usually occurs only when the States fail to enforce, when they request assistance, or when a problem has implications that cross State boundaries. EPA maintains enforcement officers in its 10 Regional Offices, but some enforcement actions are handled by the Headquarters enforcement component.

EPA's R&D program addresses all major ocean use activities within EPA's purview. It provides the scientific basis for EPA regulatory and enforcement processes through (1) information used to develop and update criteria and guidelines and establish policy relating to the environment, and (2) a cadre of resident experts who participate in enforcement proceedings and rulemaking hearings to which EPA is party.

C. Department of Commerce (DOC)

The major ocean pollution research, development and monitoring activities of the Department of Commerce are those of the National

Oceanic and Atmospheric Administration (NOAA). Additional programs are carried out from time to time by NBS and MARAD. In FY 1978, NOAA had the third largest agency budget for ocean pollution-related work, with a total of about $17,538,000 or 11 percent of the total Federal Program. This funding is expected to increase to over $24 million in FY 1980.

	FY78	FY79	FY80
		Thousand dollars	
NOAA			
Marine Ecosystems Analysis Program (MESA)	6,154	5,490	5,311
Ocean Dumping	1,900	2,295	2,870
Fisheries Habitat Investigation Program	3,522	3,378	4,713
Fisheries Microconstituent Program	495	1,196	1,206
Great Lakes Environmental Research Program	2,512	2,512	2,512
Sea Grant Program	2,358	1,648	2,712
Ocean Engineering Program	398	265	398
Other Programs	199	249	199
Long-Term Effects Program	0	2,785	4,790
Maritime Administration	0	0	0
National Bureau of Standards	0	0	0
Total:	17,538	19,818	24,711

Additional NOAA effort is supported through the interagency transfer of funds from other Federal agencies. The Outer Continental Shelf Environmental Assessment Program (OCSEAP) is funded entirely ($21.9 million) by the Bureau of Land Management to study environmental conditions and potential impacts of oil and gas development in Alaska. EPA transfer funds supported NOAA's pollution research efforts in FY 1978 at the $2.7 million level.

Thus, when interagency transfers of funds are considered, NOAA ranks first in the direct conduct or management of Federal ocean pollution research, development, and monitoring programs.

NOAA's responsibility for planning and coordination of Federal ocean pollution research and development and monitoring is mandated in Public Law 95-273, the National Ocean Pollution Research and Development and Monitoring Planning Act of 1978. NOAA's mission in marine research is defined by Reorganization Plan No. 4 of 1970 and in numerous legislative acts including:

- The Marine Protection Research and Sanctuaries Act of 1972 (Public Law 92-532)
- The Fishery Conservation and Management Act of 1976 (P.L. 94-265)
- Fish and Wildlife Act of 1956

- o Sea Grant Program Improvement Act of 1976 (Public Law 94-461)

NOAA is the lead civilian agency for dealing with the oceans as a multiple use resource that must be both used and conserved, while preserving the unique, renewable characteristics of the ocean environment. Major NOAA-funded activities in ocean pollution research and development and monitoring include the Marine Ecosystem Analysis program (MESA), the National Marine Fisheries Services habitat investigation and microconstituent programs, the Great Lakes environmental research program, the Sea Grant Program, the Ocean Dumping and Monitoring Program, the Long-Term Effects Program, and the Office of Ocean Engineering.

The Marine Ecosystems Analysis (MESA) program comprises a series of projects established to determine the "state-of-health" of regional marine coastal ecosystems where significant problems of management and environmental quality exist or are anticipated.

The MESA program is a focus for organizing and coordinating studies and evaluations of the effects of pollution and other human-induced changes in ocean ecosystems, and the effects of major disasters (natural or human-induced) on the marine environment.

The Ocean Dumping Program exists in response to Section 201 of Public Law 92-532. The Program designs, supports, and manages marine research and monitoring projects that apply to dumping sites for industrial, municipal, and dredged material waste.

The Fisheries Habitat Investigations program examines the effects of human-induced and natural changes on the abundance, distribution, and functioning of living marine resources of commercial and recreational importance.

The Fisheries Microconstituent research program comprises two complementary but distinct research areas: (1) qualitative assessment of the impact of contaminants on the fishery resources and their habitat, and (2) assessment of the impact of contaminants on the use of fishery resources from a public health standpoint.

The Great Lakes Environmental Research Laboratory (GLERL) was established to develop environmental information that is useful to decision-makers. The program is multidisciplinary in scope, ensuring the best possible use of the region's resources.

The Office of Sea Grant awards grants for research, development, education, training, and advisory services in all fields related to the development and use of marine resources and the marine environment.

The Office of Ocean Engineering has a comprehensive ocean engineering program that provides for the advancement of technology to develop oceanographic instruments and systems for measurements required in both national and NOAA ocean programs; the development and advancement of engineering capabilities and technologies necessary to support NOAA activities in ocean and coastal zone management, climate research and monitoring, and environmental protection.

The Long-Term Effects program assesses the possible long-range effects of ocean pollution and other human-induced stresses on the marine ecosystem. The major thrust of the program is to identify and, where necessary, recommend corrective action with respect to potentially serious problems in the oceans before they reach a crisis stage or become uncontrollable.

Three other DOC components conduct ocean-pollution-related activities, but no funding was reported for FY78. These are the Maritime Administration (MarAd), which carries out work under the Federal Water Pollution Control Act of 1972 as part of its responsibilities for commercial vessel operation and pollution abatement; the National Bureau of Standards, which is responsible for establishing measurement standards and related analytical methodology, and the National Technical Information Service (NTIS) which was created by the Congress in 1950 (Title 15, U.S.C. 1151-1157) as a clearing house for U.S. and foreign government-sponsored research, development, and engineering reports and for other analyses prepared by national and local government agencies, their contractors or grantees, or special technology groups.

D. Department of Energy (DOE)

In FY 1978, DOE spent $15.7 million on ocean pollution research, development, and monitoring, nearly 10 percent of the total Federal Program. This funding level is expected to remain approximately level through FY 1980. The DOE budget for FY 1978-80 is summarized below:

	FY78	FY79	FY80
	Thousand dollars		
Regional Programs	6,652	4,926	4,782
Strategic Petroleum Reserve Office (SPRO)	4,513	6,726	4,500
Ocean Thermal Energy Conversion (OTEC)	1,406	2,094	2,815
Other Programs	3,099	3,130	3,130
Total	15,670	16,876	15,227

DOE was established in 1977 from the former Energy Research and Development Administration (ERDA) and several other government entities. Its mandates relate to development and use of energy sources and assessment of the effects of energy technologies, including nuclear power via a mandate passed to ERDA in 1975 from the former Atomic Energy Commission (AEC). Programs involving marine pollution include: administration of the Strategic Petroleum Reserve within restrictions of the National

Environmental Policy Act (NEPA) of 1969, particularly with regard to disposal of brines in the Gulf Coast regions of Louisiana and Texas; development of marine-related energy conversion technologies such as ocean thermal energy conversion (OTEC), and systems to use the energy of waves, tides, currents, and salinity gradients; and management of R&D (by the Office of Health and Environmental Research) on the environmental effects of energy-related pollutants including their release, transport, and fate in the coastal zone, pathways and fates from different sources into physical and biological systems, and the resilience of biological systems to disturbance by energy activities. Research work is conducted by university contractors and within DOE facilities. Regional ocean areas under study include the Northwest Atlantic by the Brookhaven National Laboratory, South Atlantic Bight by Skidaway Institute of Oceanography, California coastal areas by Scripps Institution of Oceanography, and the Pacific Northwest coast by University of Washington. Research topics include movement of trace metals and radionuclides in rivers, estuaries, and coastal waters, resulting concentrations in marine life, and effects of oil spills and release of heated water.

E. National Science Foundation (NSF)

NSF spent $15,134,000 of its total marine science budget in FY 1978 on pollution related projects. Future levels are difficult to predict because most projects are initiated by unsolicited proposal from the academic community less than one year in advance of funding approval. However, to support ongoing projects and anticipated renewal of current projects about $15,006,000 will be expended in FY-79 and $13,655,000 in FY-80.

NSF supports, but does not itself perform, research on basic oceanographic questions relevant to ocean pollution problems through its division of Ocean Science and the International Decade of Ocean Exploration (IDOE) program. Most research is conducted at academic institutions, but industrial-academic projects are possible. Many NSF-sponsored studies are of value in predicting the movement and fate of pollutants and assessing the response of individual species and biological communities to stresses that could lead to irreparable damage. The IDOE program of the 1970s supported international research teams and globally planned and coordinated studies. IDOE's Environmental Quality Program, which was designed to provide information on the quality of the marine environment and to assess and predict human impact on the ocean, included four major investigations, Geochemical Ocean Sections Study (GEOSECS), Pollutant Transfer Program, Biological Effects Program, and Controlled Ecosystem Pollution Experiment (CEPEX).

F. Department of Defense (DOD)

Research funded by the Department of Defense (DOD) amounted to $8,802,000 in FY 1978. This is expected to decrease to $6,565,000 by FY 1980. The DOD budget is summarized below.

	FY78	FY79	FY80
	Thousand dollars		
Navy	6,437	5,209	4,478
Army Corps of Engineers	2,365	2,112	2,087
Total:	8,802	7,321	6,565

DOD ocean pollution research and development and monitoring activities are primarily those of the Department of the Navy and the Army Corps of Engineers. Most U.S. Navy environmental research is in response to its special operational needs and environmental quality standards established by other regulatory agencies. It relates to problems of disposal of sewage and solid waste, polluting effects of antifouling technology, oil/water separator systems, ballast wastewaters, water monitoring for ordnance compounds, and toxic waste reduction and treatment. The Army Corps of Engineers has a major national role in civil works programs and additional specific responsibilities for waterways management. It studies effects of waste disposal at open-water sites, effects of dredging, use of dredged material, habitat development, assessment of marsh and estuarine environments, prediction and control of erosion and sedimentation, dynamics of benthic populations, stability of beaches and shores, and the interaction of environmental and socioeconomic forces affecting coastal development.

G. Department of Transportation (DOT)

The U.S. Coast Guard and Materials Transportation Bureau fund DOT's contribution to the Federal Program for ocean pollution research, development, and monitoring. In FY 1978, the DOT budget was $8,803,000 and is expected to be about $6,000,000 in FY 1980. The FY 1978-80 budget is summarized below:

	FY78	FY79	FY80
	Thousand dollars		
Coast Guard			
Marine Environmental Protection	8,405	7,923	5,991
Port Safety	120	0	0
Commercial Vessel Safety	278	525	0
Materials Transportation Bureau	0	0	0
Total:	8,803	8,448	5,991

Within DOT, the Coast Guard (USCG) has primary responsibility for the safe movement of vessels and for the quality of the marine environment as it is affected by transport of oil and hazardous chemicals within U.S. port areas and waterways. Statutory authorities for these responsibilities derive in part from the Ports and Waterways Safety Act, Port and Tanker Safety Act, Tank Vessel Act, Federal Water Pollution Control Act, and Dangerous Cargo Act. To accomplish these tasks, USCG regulates and enforces minimum standards for design, construction, alteration, repair, maintenance, and operation of vessels; controls or supervises waterfront operations and vessel traffic; and regulates the handling, storage, and carriage aboard vessels of all dangerous and hazardous materials, such as explosives, flammable liquids and solids, oxidizing materials, corrosive liquids, compressed gases, and poisonous articles. Under the Federal Water Pollution Control Act, USCG also has responsibility for preventing pollution from oil and hazardous substances from vessels and transportation-related facilities and for mitigating discharges of oil and hazardous substances from any source in the coastal zone, ports, harbors, Great Lakes, or Outer Continental Shelf. USCG is also responsible for mitigating pollution that can affect natural resources belonging to, appertaining to, or under the exclusive management authority of the United States, including resources under the Fishery Conservation and Management Act of 1976. Further, USCG works to improve safety and prevent pollution at sea in its role as the coordinating U.S. representative to the Inter-Governmental Maritime Consultative Organization (IMCO) of the United Nations.

An active research, development, monitoring program is carried out to support USCG's programs for marine environmental protection, commercial vessel safety, and port safety. Much of the work in the latter two program areas is performed primarily to enhance safety and protect life and property. Although almost all these efforts reduce the potential for pollution, this plan includes only those that are specifically intended to detect or reduce pollution. Also not included are operating programs such as the facility and vessel inspection programs and pollution surveillance programs.

Most research, development, and monitoring efforts in support of the above programs are performed within the commercial sector. However, these missions are also supported through the USCG Research and Development Center, Shipboard Fire and Safety Testing Facility, and DOT Transportation Systems Center.

H. Department of Health, Education, and Welfare (HEW)

The HEW budget for FY 1978 was $3,898,000; this is expected to remain about level through FY 1980. The FY 78-80 budget is summarized below.

In HEW two components of the Public Health Service -- the National Institutes of Health (NIH) and the Food and Drug Administration (FDA) -- conduct and support research and manage programs relating to ocean pollutants and their effects on human health. NIH, with responsibilties for

	FY78	FY79	FY80
	Thousand dollars		
Food and Drug Administration	2,620	2,585	2,570
National Institutes of Health	1,278	1,148	1,013
Total	3,898	3,733	3,583

prevention and treatment of disease and promotion and protection of human health, makes studies through its Institute of Environmental Health Sciences on biological effects of environmental contaminants. FDA, which is responsible for the purity and quality of foods shipped in interstate commerce, inspects canned and processed seafoods and administers the National Shellfish Sanitation Program (NSSP) -- a Federal-State-industry program for sanitary control of the shellfish industry. Only oysters, clams, and mussels are included in this program, which FDA coordinates at the Federal level without regulatory, licensing, or enforcement authority. State agencies manage program operations and monitor, classify, and control about 14.1 million acres of shellfish waters in State territorial waters out to 3 miles offshore. About 600 square miles of sludge dumping sites off New York Harbor and Delaware Bay are monitored in cooperation with EPA, NOAA, and Coast Guard. Research on contaminants includes viral and bacteriological microorganisms, toxic metals, radionuclides, and naturally occurring marine toxins.

I. National Aeronautics and Space Administration (NASA)

NASA spent $1,750,000 on ocean pollution development work in FY 1978. The funding level is expected to be $531,000 in FY 1979 and $1,650,000 in FY 1980.

NASA was established by the National Aeronautics and Space Act of 1958 (Public Law 85-568). The Act specifies that activities in space are to contribute to the most effective use of the U.S. scientific and engineering resources -- through close cooperation with interested Federal agencies and agreements between NASA and any State, political subdivision, public, or private agency. Although NASA does not have direct statutory responsibility for any monitoring activity, the Congress has directed other agencies to seek NASA's assistance and has directed emphasis toward NASA projects through specific actions. The Federal Water Pollution Control Act of 1972 (Public Law 92-500) charges the Administrator of EPA with using the resources of NASA and other agencies to establish, equip, and maintain a water-quality surveillance system. NASA authorization and appropriations actions for 1978 identify support for the application of space technology to detecting and monitoring oil spills in U.S. waters and to controlling other pollution problems.

NASA's marine pollution activities include analysis and interpretation of remotely sensed data relating to Great Lakes water quality, investigations of ocean dumping and environmental baseline monitoring in the coastal zone, study of red tide and coastal zone water quality characteristics, and use of electrochemical methods to detect and monitor coliform bacteria levels in coastal waters. Much microwave sensor work relates to methods and systems to remotely observe and model oceanic phenomena.

J. Nuclear Regulatory Commission (NRC)

The FY 1978 budget for ocean pollution research, development, and monitoring for NRC was $1,245,000. This funding level is expected to decrease to $955,000 in FY 1979 and $965,000 in FY 1980.

NRC is directed by the Energy Reorganization Act of 1974 to perform research to confirm specific problems encountered during the nuclear regulatory process. NRC performs little direct research or monitoring. It stimulates monitoring programs by applicants for licenses and by those who are granted licenses. These programs include baseline studies made before submitting applications, preoperational studies that focus on problems identified during baseline studies, and postoperational monitoring to assure compliance with license conditions. Baseline studies provide information needed by NRC to prepare Safety Analysis Reports and Environmental Impact Statements. Operational monitoring programs by licensees focus on potential radionuclide pathways to humans. NRC provides guidelines on radiological environmental monitoring for use in routine operation of nuclear facilities. These guidelines include instructions for measuring, evaluating, and reporting radioactivity levels in solid wastes and releases of radioactive material in liquid and gaseous effluents from light-water cooled nuclear powerplants. NRC's Office of Inspection and Enforcement contracts with 16 States to perform "spot check" monitoring for quality assurance and maintains an in-house capability for radiological monitoring in response to specific incidents and as part of the NRC emergency preparedness program. In January 1979 monitoring programs were being conducted at 23 sites of proposed or operating nuclear facilities in the coastal zone.

K. Department of Agriculture (USDA)

USDA spent $115,000 in FY 1978 for ocean pollution research, development, and monitoring. This funding level is expected to remain constant through FY 1980.

Most USDA ocean pollution research, development, and monitoring efforts are directed at reducing detrimental effects of agricultural practices on the quality of the environment. Study areas include research on problems caused by runoff and waste disposal, offsite and downstream effects of sediments, nutrients, and pesticides, transport and transformation of pollutants, and their effects on different organisms and ecosystems. Emphasis is on management and use of the Nation's soil, water, and air, and on reducing pollutants in receiving estuarine, lake, and ocean waters. Research is accomplished through inhouse efforts, cooperation with State and other universities, and through contracts and grants. Statutory authorities for research include the Department of Agriculture Organic Act of 1862 (5 U.S.C. 511), Research and Marketing Act of 1946 as amended (70 U.S.C. 427, 4271), National Agricultural Research, Extension, and Teaching Policy Act of 1977 (Public Law 91-113), and other Congressional mandates.

CHAPTER III: NATIONAL NEEDS AND PROBLEMS AND INITIAL ANALYSES BY PROBLEM AREAS

National needs and problems must be viewed from several perspectives -- pollutants of concern in the marine environment, effects of pollution, causes of ocean pollution, tools for evaluating ocean pollution problems, and tools for controlling and mitigating ocean pollution. Each of the following sections of chapter III discusses needs, describes responsive Federal activities, and presents initial analyses of the overall situation with respect to one of these perspectives.

A. Pollutants of Concern in the Marine Environment

This section of chapter III of the Federal Plan identifies key pollutants that find their way into the oceans and describes the problems associated with them. Pollutants of concern are grouped into the following categories:

- petroleum and petroleum products
- metals and inorganic chemicals
- synthetic organic chemicals
- artificial radionuclides
- habitat modification and sediment deposition
- nutrients and biostimulants
- cooling water use
- microorganisms and pathogens
- chlorination products
- other pollutants.

A more detailed discussion of scientific problems associated with these pollutants is set out in The Proceedings of a Workshop on Scientific Problems Relating to Ocean Pollution, Estes Park, Colo., July 10-14, 1978 (Working Paper No. 6).

Federal programs in ocean pollution research, development, and monitoring fall into two categories -- generic studies that collect baseline data, define natural processes, and identify information relevant to all pollutants and specific studies that are directed at individual classes of pollutants and their associated problems. Pollutant-specific studies accounted for about 65% of the fiscal year 1978 Federal Program, with generic studies accounting for the remaining 35%.

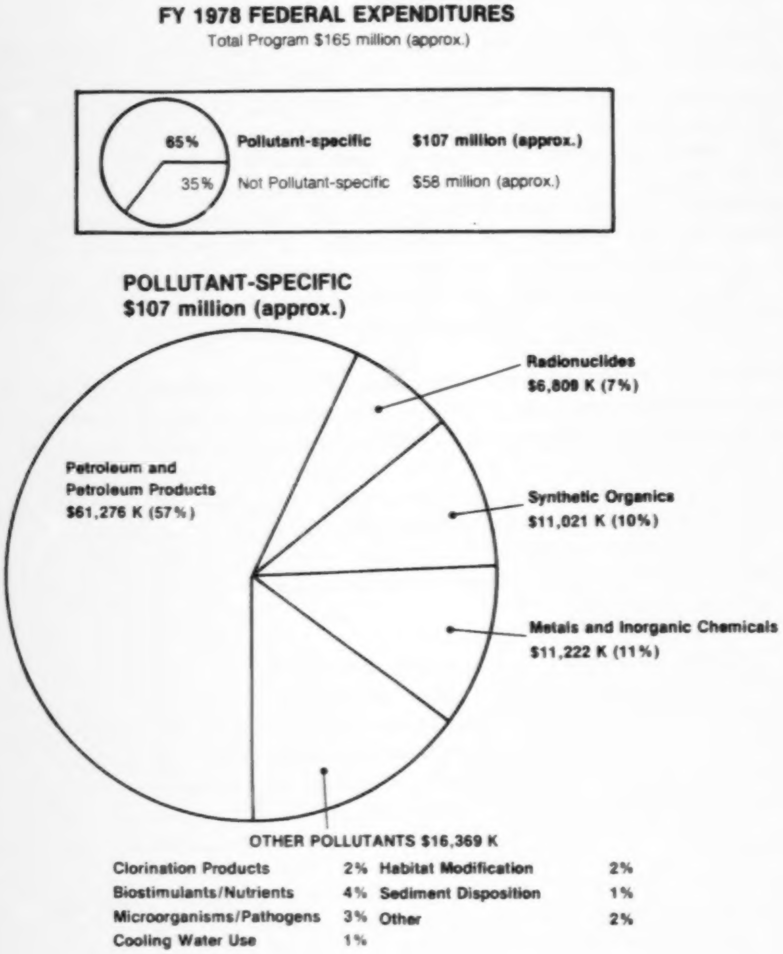


Figure 1—FY 1978 Federal Program for Ocean Pollution Research, Development and Monitoring: Pollutants

More than half of the fiscal year 1978 Federal funding (57%) for pollutant specific work was spent on research, development, and monitoring related to problems associated with petroleum and petroleum products. About 11 percent was spent on studies of metals and inorganic chemicals, 10 percent was spent on studies related to synthetic organic chemicals, and 7 percent was spent on studies related to artificial radionuclides. The remaining pollutant specific funding (15%) was spread among the other seven categories of pollutants and associated problems, as shown in figure 1.

1. Petroleum and Petroleum Products

Contamination of the marine environment by petroleum has received extensive publicity in recent years. In many instances the dominant theme has been the threat of ecological disaster resulting from accidental petroleum spills. In certain cases (for example, the 1978 *Amoco Cadiz* spill off the coast of France) some of the worst fears for damage to marine species and associated industries appear to have been realized. In other instances, little short-term damage has been detected after fairly substantial accidental introductions of petroleum into the marine environment -- usually because these latter spills have not reached coastlines. They occurred in open ocean areas where natural conditions contributed to rapid dilution, evaporation, and dispersion.

Nevertheless, continued introduction of large amounts of petroleum and petroleum products into the oceans remains a potential threat to the viability of the marine ecosystem. While concentrations of crude petroleum on the order of parts per million are needed to kill most adult marine animals in laboratory studies, long-term exposure to concentrations of petroleum hydrocarbons in the parts-per-billion range disrupt behavior patterns of certain marine animals. Very little is known about these long-term effects of petroleum exposure as they relate to continued survival of marine species.

Crude petroleum and petroleum products are composed of hundreds of different individual components. Some of these components are readily measured. Others can be quantified only by the most advanced analytical chemical techniques, and some cannot yet be measured. Petroleum compounds are metabolized by the enzymes of fish and other marine species. After exposure to petroleum their tissues contain traces of the original petroleum components as well as a variety of metabolites of the original petroleum components. Only a few of the metabolites have been identified so far, and their effects on marine animals are largely unknown. Moreover, spilled petroleum is continually undergoing chemical change ("weathering") in the ocean, and the effects on marine biota of these changed compounds are also largely unknown.

Sixty-one million dollars, amounting to almost 40 percent of the total Federal ocean pollution research, development, and monitoring program for fiscal year 1978, was expended on studies of problems related to petroleum and petroleum products. Of that amount, DOI spent 71 percent, EPA 10 percent, and USCG 11 percent. NOAA, Navy, HEW, and USDA programs accounted for the remaining 8 percent. Slightly more than one-third of the petroleum program ($22.7 million) was devoted to baseline studies funded primarily by BLM with a few small projects by EPA and DOE. Of the baseline studies, about 25 percent were biological studies, 57 percent were physical and chemical studies, and the remainder were studies of geological hazards. Research dealing with other pollution problems associated with development of offshore oil and gas (e.g., the ecological impact of drilling muds) cost $350,000.

Of the total petroleum-related program, 15 percent was used to fund studies of the effects of oil on birds, mammals, fish and benthic organisms, plants, and ecosystems in general. Another 10 percent was used to fund studies of the behavior and movement of oil, including measurement of existing distributions of hydrocarbons in the environment and development of dispersion and trajectory models. USCG, NOAA, EPA, and BLM spent more than $2 million on scientific studies of accidental spills that occurred in the waters of the United States during FY 1978.

About $5 million (8% of the total petroleum program) was spent on development activities related to pollution by oil and other hazardous materials. DOI/USGS used a small amount ($750,000) to fund development of equipment related to safety and inspection of offshore platforms. USCG, Navy, and EPA spent more than $3 million to develop and test cleanup and containment systems for spilled materials and to develop treatment systems for oily waste water discharged from vessels. One million dollars was used to fund development of sensor systems for detection and surveillance of spills of oil and other hazardous materials. About 1 percent of petroleum program funding was directed by USCG and EPA toward developing techniques for reducing or preventing spills from damaged vessels. FY 1979 and 1980 plans call for greater emphasis in this area. It should be noted, however, that this figure does not include USCG's considerable in-house study effort on the need for defensively placed segregated ballast, or the efforts of the U.S. Navy to improve general salvage capabilities. These activities, while not carried out specifically to reduce pollution, may have such secondary benefits but are beyond the scope of this document. EPA, USCG, and NOAA spent more than 3 percent of the total program for the development of chemical and biological methods to measure hydrocarbons and their effects. Although BLM plans to increase its effort in the area of quality assurance in FY 1980, BLM expenditures in this area in FY 1978 were $140,000, less than 0.5 percent of the petroleum-related Federal effort.

Research related to economic, cultural, and aesthetic aspects of Outer Continental Shelf activities accounted for less than 1 percent of the overall program in 1978. However, these studies are expected to be substantially expanded in FY 1979 and 1980.

About 14 percent of the $61 million Federal research, development, and monitoring expenditure in the category of petroleum and petroleum products was directed at spill response and cleanup activities. These are also applicable to other spills of hazardous materials. The remainder of the program described in this section was solely oil related.

2. Synthetic Organic Chemicals

This category includes a large number of organic chemicals, pesticides, and herbicides, many of which have been developed in the past few decades. Hundreds of different compounds are included. One broad class is the halogenated hydrocarbons (e.g., Kepone, DDT, PCBs, Dieldrin). These halogenated hydrocarbons are widely used as solvents, pesticides, heat exchanger fluids, dielectrics, and polymer intermediates. Some are characterized by a high degree of chemical stability. These compounds tend to be only slightly soluble in water; however, they can be transferred to living organisms via diet. When so assimilated, they tend to remain in tissues for long periods. Another broad class of synthetic organics is the lower molecular weight chlorinated hydrocarbons whose bioaccumulation factors are 100 to 1,000 times smaller than those of heavier halogenated compounds. Many of these lower molecular weight compounds also undergo more rapid degradation in the environment. Although known concentrations of these compounds in the marine environment are far below toxic levels, little is known about their sublethal effects on marine organisms.

Another class of synthetic organic chemicals is the organophosphate pesticides (e.g., Malathion, Parathion, Chlorfeninphos), which are to some extent replacing organochlorine compounts for agricultural use. Organophosphates act on the nervous system and may be toxic to mammals and aquatic species. However, they are less persistent in the marine environment than organochlorine compounds, although they probably cause problems in local areas. The same is most likely true of the carbamate compounds, another class of insecticides used in place of DDT. In addition, there are several herbicides containing organic mercurial compounds and a number of metal-containing pesticides that pose varying degrees of threats to living resources.

The scientific literature has reports of lethal and sublethal effects of synthetic organic chemicals on marine and freshwater species. Threshold concentrations necessary to cause such effects vary widely between different species and with different chemicals. Sublethal or chronic effects of synthetic organic chemicals are reversible or irreversible, depending on the circumstances of exposure, including such factors as the life stage of exposed animals, concentration of the pollutant, and duration of exposure. The most severe and irreversible effects of synthetic organic chemicals occur in early life stages (embryo through juvenile) of marine fishes and invertebrates. Disruption of the nervous system is the most prevalent lethal effect of these compounds. DDT (and especially its breakdown product DDE) has been particularly implicated in effects on seabirds ranging from various subtle disturbances io behavior to egg-shell thinning with resulting reproductive failure. Such effects have been implicated in the near-total disappearance of some bird populations.

Restrictions have been imposed on the release of both DDT and PCBs to the marine environment. Nevertheless, even if future use in the United States is eliminated, parent compounds and/or derivatives will persist for many years, because of their chemical stability. Use in some other nations, however, is not expected to be greatly reduced, because the overall benefits of DDT in food production are thought to outweigh substantially the resulting longer term environmental harm.

About $11 million was spent in FY 1978 on marine pollution research related to synthetic organic chemicals, including pesticides and hazardous and toxic organic substances other than petroleum. EPA spent more than 50 percent of this. In addition, NSF, DOT, and NOAA each had programs of $1 million or more.

About 23 percent of the effort was research on the effects of synthetic organic chemicals. About 75 percent of this effects research was directed toward ecosystem effects and changes in growth and reproduction rates of organisms exposed to these compounds. EPA and NSF supported most of the effects studies. The other 25 percent of these effect studies relates to human health and the identification of mutagenic, carcinogenic, and teratogenic organics in the marine environment. In addition, research is being carried out to determine the pathways of organics in the human food chain and direct effects on human health.

The DOT and EPA spent about 16 percent of the total FY 1978 synthetic organics funds on research to develop methods for detecting and cleaning up hazardous chemical spills and to develop techniques to prevent future spills.

Seven different agencies supported research to determine sources and movement of organics, including pesticides, in the marine environment. These studies include identifying new organics in the marine environment, monitoring present levels, and determining distribution patterns. About 3 percent of total organics funds were spent in this area of research and monitoring.

EPA and NOAA have research and monitoring programs for organics in the Great Lakes that account for about 6 percent of the total organics program. These studies cover the spectrum of information needed to understand organics in the Great Lakes ecosystem. Additionally, a significant effort is being made to understand the movement and effects of PCBs in marine and Great Lakes ecosystems.

EPA also has a major research and monitoring effort related to organics and pesticides in Chesapeake Bay. This program accounts for about 26 percent of the total spent on organics. These studies are designed to develop an understanding of the distribution, fate, and effects of pesticides and other toxic organics in the Chesapeake Bay ecosystem and to monitor input levels of these materials to the Bay.

NOAA supports a research and monitoring effort (4% of the synthetic organics total) to determine the effects of ocean disposal of pharmaceutical wastes.

The remaining 3 percent of the total for synthetic organic chemicals was spent to develop methods for measuring these materials in the marine environment. Of this 3 percent, about half was expended on quality assurance and interlaboratory comparison of data and methods.

3. Metals and Inorganic Chemicals

Inorganic chemicals that are considered to be particularly important marine pollutants include acids, alkalis, cyanides, and metals. Although acids, alkalis, and cyanides can be highly toxic in localized areas, their effects are quickly netutralized by the ability of seawater to buffer, biodegrade, and essentially inactivate them in the environment. Because it is difficult to distinguish between human-induced input and natural geochemical fluxes of metals in the marine environment, the impact of these wastes is difficult to assess. Human-induced sources of metals and inorganic chemicals include the release of industrial and sewage effluents into rivers and oceans, combustion of fossil fuels, and dumping of wastes into the ocean.

The most toxic metals are mercury, silver, copper, cadmium, lead, zinc, chromium, tin, and selenium. Several factors may influence the toxicity of these metals to a particular marine organism. They are (1) the physiochemical form of the metal, (2) the synergistic or antagonistic action of other associated compounds, (3) the condition of the seawater (salinity, temperature, pH, etc.), and (4) the physiological condition of the organism. Much of the information about lethal effects of metals on marine animals has been developed through short-term laboratory experiments. The basic mechanism for these acute effects is primarily interaction of metals with tissue proteins, often resulting in alteration of enzymatic activity. Laboratory experiments have demonstrated long-term, sublethal effects of some metals. Although considerable research has been carried out on metals in their elemental form, little is known about the role of the various complex forms of metals in the marine ecosystem and their effects on living organisms.

Although high concentrations of metals have been detected in marine organisms, these instances were generally quite localized and occurred near the point source inputs. In a few isolated cases such as the Minimata, Japan, mercury disaster, metals have found their way to humans through the marine food chain. The scientific literature contains few examples of deleterious effects of high levels of metals on free-swimming marine organisms. However, as with most pollutants, increased contamination by metals in the marine environment may lead to harmful effects on biota. For some metals, detrimental effects on the marine ecosystem can be demonstrated at concentration levels an order of magnitude above ambient.

Almost $11 million was spent in FY 1978 studying metals and inorganic chemicals in estuarine and ocean ecosystems and the Great Lakes. DOE, DOI, HEW, EPA, NSF, and NOAA supported most of this research effort (96%). Other agencies supporting research on metals and inorganic chemicals were NRC, DOD, and USDA.

Studies on characterization of metals, their distribution, movement, exchanges, and fate in the physical ecosystem account for 34 percent of the total Federal effort in the metals and inorganics area. These studies were supported by NSF, DOE, NOAA, DOI, and EPA. They range from baseline studies needed for understanding the behavior of metals and inorganic chemicals in physical systems to studies on the distribution of metals in sediments, the sediment-water interface, the water column, and the atmosphere above the marine ecosystem. Studies underway in fiscal year 1978 involved over 20 different metals.

DOE is supporting a major effort on the effects and fate of brine pumped from proposed salt dome storage facilities for strategic petroleum reserves. These studies, which are concerned with effects of brine, trace metals, and temperature, account for 23 percent of the metals and inorganics effort in FY 1978. Funds for this effort are proposed to triple in FY 1979 and be reduced in the following years.

Another major effort (19% of total metals and inorganics funding) deals with movement and concentration of metals via trophic level transfers in the marine food chain. These studies involve the effects of metals on growth and reproduction of organisms as well as possible human health effects from consumption of contaminated seafood.

EPA supports a significant effort (9% of the total metals and inorganics funding) on Chesapeake Bay. EPA (8%) and NOAA (1%) also support studies on the Great Lakes. These studies are directed at defining baseline conditions in these ecosystems as well as distribution, movement, and exchange, to develop a better understanding of the effects of metals in the ecosystem.

Five percent of the total metals and inorganics funding was spent to determine the fates and effects of metals and inorganic chemicals in waste disposal areas. Most of this work was done in the New York Bight area, as part of NOAA's Marine Eco-Systems Analysis (MESA) program. A small effort (less than 1% of the metals and inorganics effort) was spent to develop new methods and techniques for determining metals concentrations in the marine environment and for quality assurance purposes.

4. Artificial Radionuclides

At present, the principal marine sources of manmade radionuclides are fallout from above-ground nuclear weapon tests and releases from nuclear power facilities. A potential future source of radionuclides is leakage from ocean-dumped containers of low-level radioactive wastes. These wastes, which result from reprocessing of spent nuclear powerplant fuel rods, may be disposed of at sea in the future. The physiochemical interactions by which radionuclides are distributed in the marine environment are not well understood, especially with respect to the transuranics (plutonium, americium, and curium). However, a large fraction of the transuranics are ultimately deposited in ocean sediments through a complex series of physical, chemical, and biological interactions in the marine environment. Although much is known about the concentrations of artificial radionuclides in the marine environment, it is difficult to assess their effects, because so little is known about their in situ chemical behavior.

Potentially toxic effects of artificial radionuclides on marine organisms would be expected to appear at the population level as well as the individual organism level. However, assessment of effects at the population level is hampered by a lack of relevant experimental data. Although natural and laboratory populations have been exposed to radiation, the dose rates were far above levels existing or expected in the marine ecosystem. Experimentation with individual marine organisms has demonstrated that transuranic-derived alpha particle radiation causes biological changes, with primitive animals being more resistant and young fishes being most sensitive. Also, it has been postulated that low-level exposure to radiation can cause genetic changes.

Even though artificial radionuclides can be toxic to marine plants and animals, no deleterious effects on these biota would be expected from current concentrations of radioactive elements in the marine environment. The radiation dose received by humans via food from the oceans as a result of worldwide fallout and discharges into the sea by nuclear reactors is at present very small. With increasing future uses of atomic energy, however, the risk of accidental contamination of the marine environment becomes greater. Such contamination could lead to an increase in background levels of radiation and to point sources of artificial radionuclides which might be damaging both to marine biota and to man.

In FY 1978 about $6.8 million was spent on ocean pollution research, development, and monitoring related to radionuclides by DOE, NRC, EPA, NSF, and FDA. DOE supported about 75 percent of the program, and NRC 3 percent.

EPA contributed 8 percent for study of the fate and effects of radioactive wastes disposed prior to 1970 at oceanic dumpsites. FDA, through their national shellfish monitoring program, spent about 9 percent on monitoring radionuclide levels.

Most DOE activities were directed toward defining natural ocean processes that influence radionuclide distribution, and toward understanding the behavior and fate, in the ocean and estuaries, of radionuclides derived from fallout and nuclear waste disposal. Regional projects to determine radionuclide levels in water, sediments, and, in some cases, organisms, were carried out in the Columbia River estuary, Hudson River estuary, Savannah River estuary, Mississippi River estuary, and other estuaries draining into the Atlantic Ocean and Gulf of Mexico. Another effort is the study at Bikini and Enewetok Atolls in the Marshall Islands aimed at defining the level and distribution of radionuclides in the groundwaters, lagoon, surrounding ocean waters and sediments,and marine biota. NSF sponsored an additional 4 percent of the work in the radionuclides area for basic research directed at understanding the behavior and distribution of radionuclides in the ocean.

NRC directed almost all of its efforts toward developing models and studying transport of radionuclides resulting from nuclear powerplants operations. A study on the behavior of radionuclides discharged from nuclear powerplants is planned for FY 1980.

A great deal of general research on fates of radionuclides and their effects on organisms has been done in the past. Therefore, a relatively small portion of the ocean pollution program has been or is planned to be devoted to determining the effects of radionuclides on marine organisms. Four to 5 percent of the $6.8 M Federal effort in this area is being directed toward studies of the effects and mechanisms of radionuclide uptake by organisms and at monitoring radionuclide levels in shellfish.

5. Habitat Modification and Sediment Deposition

Sediment directly degrades the marine environment and also acts as a carrier of adsorbed pollutants. The primary source of sediment is freshwater runoff, which carries nonpoint source erosion materials resulting from inadequately controlled agricultural and logging practices and coastal development. Excessive sediment loads can modify marine ecosystems by physically covering benthic habitats and by reducing light penetration. As a carrier of other pollutants, sediments can introduce nutrients and toxic materials adsorbed on the surface of particulates. Dredging and filling of wetlands and river mouths, and deep-sea mining, are also sources of sediments that can modify marine habitats.

The COE and NOAA account for 82 percent of the approximately $4.8 million FY 1978 Federal expenditure on ocean pollution research, development, and monitoring activities related to habitat modification and sediment deposition. Other agencies involved were EPA, FWS, USGS, and the Navy. This total does not include the COE projects funded through district offices.

NOAA spent 25 percent of the total in this category on the Deep Ocean Mining Environmental Studies (DOMES) Program, which was directed at determining the environmental consequences of deep seabed mining. This program included studies on the direct physical effects of the mining dredge on benthic populations, as well as the effects of surface discharge of the sediment plume that results from mining operations.

About 55 percent of the total Federal effort on sediment and habitat modification was spent on dredging and dredged material related studies by COE, NOAA, EPA, and USGS. Of this 55 percent, 17 percent was directed by COE, EPA, and NOAA toward determining the effects of dredged material dumping on benthic organisms, on characterizing changes at disposal sites and on stabilization methods for disposal sites. Thirty-eight percent was spent, primarily by COE with limited participation by the Navy and USGS, on exploring alternatives to dredging, improved dredging techniques, and equipment for minimizing dredging and dredging effects. COE spent the other 45 percent of the dredging total on studies of breakwater and channel stability, development of methods to reduce siltation in channels, and development of models to predict sedimentation resulting from storms.

Construction and structure placement are additional causes of sedimentation and habitat modification. About 8 percent of the total sedimentation and habitat modification funds were directed toward studies in this area. Topics addressed include predicting effects of structure placement on wetlands and on sedimentation in navigational channels, control of sedimentation during construction and design of small boat basins with maximum flushing characteristics. EPA funded a $67,000 effort to study the effects of pipeline burial in the Gulf of Mexico, but BLM plans a considerably larger effort on this problem in the Gulf ($1 million) for FY 1979.

The remaining work in this area consisted of small studies by EPA, NOAA, and FWS ($250,000) on wetlands and estuaries in Alaska and the impact of logging and other activities on these ecosystems, as well as $150,000 on the effects of recreational boating on aquatic vegetation in Chesapeake Bay and the effect of water use practices on Great Lakes fish.

With the exception of funding for DOMES project, which will probably decrease, efforts in the sediment and habitat modification area are expected to continue at existing levels through FY 1980.

6. Nutrients and Other Biostimulants

Primary production rates in the world's oceans can vary naturally by a factor of 10. Highest rates are normally associated with an abundant, balanced supply of nutrients, and ideal conditions of sunlight and temperature. In contrast to freshwater systems where phosphate usually is the limiting nutrient for production of plant life, nitrogen is probably the limiting nutrient for plant growth in the sea. Unbalancing the nutrient supply can result in effects ranging from general enhancement in growth of original plant and animal species to grossly altered species composition or complete loss of ecosystem viability. Nutrient enrichment may be either beneficial or extremely detrimental to many existing aquatic plants and animals and to the overall ecosystem. There have been few attempts to rigorously quantify the effects of nutrient enrichment on the quantity and quality of plant and animal life in the actual marine environment. However, attempts have been made to correlate laboratory studies of balanced nutrient enrichment with field values and to predict possible changes that might result.

Ocean pollution-related research, development, and monitoring on nutrients costing almost $3.7 miillion was carried out by EPA, NOAA, DOE, and DOI in FY 1978. Most of this effort focused solely on effects of nutrients. However, several studies included effects of metals, synthetic organics, and hydrocarbons in conjunction with increased nutrient levels. Twenty-four percent of the effort ($900,000) was carried out in the Great Lakes, and 38 percent ($1.4 million) was carried out in the Chesapeake Bay by EPA and USGS. Of the $3.1 million spent in marine waters, DOE spent about 13 percent to study sources of nutrient-rich waters and their impact on phytoplankton in the South Atlantic Bight. This effort is expected to expand modestly through FY 1980. EPA funded several projects on the effects of nutrients on marine organisms; however, in FY 1978 these were less than 6 percent of the total spent and are planned to end by FY 1980. NOAA and EPA both funded mariculture related research on the relationships between nutrients and commercially important fish and shellfish (8%) and on the use of marine organisms for waste disposal (12%) (sewage and rum distillery wastes). About 8 percent of the marine-related work in the nutrient area is directed by NOAA and EPA toward development of management information, primarily models that include nutrient effects in Chesapeake Bay, Louisiana wetlands, New York Bight, and the Great Lakes. NOAA spent less than 1 percent of the nutrients and biostimulants total to develop instrument techniques for measurement of nutrient levels.

EPA, NOAA, and DOE spent slightly less than $900,000 on nutrient-related research in the Great Lakes. Most of their work was directed toward collecting information describing the relations between nutrients, phytoplankton, and algal blooms for use in developing models that can be used for management decisions related to eutrophication. The remaining Great Lakes work focused on development of models to address the effects of land-use practices.

7. Cooling Water

Use of marine waters for powerplant and industrial cooling causes several pollution problems. Cooling water is returned at a temperatures higher than that of the receiving water-body. This can cause temperature stress on local biological communities, and warmer water species may be attracted to the area, changing the natural organism distribution either beneficially or adversely. Synergistic effects may result from the presence of other pollutants such as metals and organics. Problems of entrainment and impingement arise from drawing large amounts of marine waters and associated biota through cooling water systems. While larger fish and organisms can be kept out of cooling systems by covering intakes with protective screening, some organisms are injured. Those passing through the screening (the planktonic species, including fish eggs and larvae) may be totally destroyed, thereby affecting local ecosystems.

Ocean Thermal Energy Conversion (OTEC) facilities located in the open ocean will cause problems similar to those associated with the use of inshore cooling water. As part of the OTEC process, large volumes of cold, nutrient-rich bottom waters are pumped from 500-meter depths to the ocean surface, causing thermal pollution as well as problems of impingement and entrainment.

In FY 1978 the Federal government spent about $1.2 million on studies related to polluting consequences of using marine waters for OTEC and for industrial and powerplant cooling. The primary agencies involved are DOE, EPA, NRC, NOAA, and FWS. Almost 50 percent of the effort was directed at evaluating temperature effects on fish, plankton, and benthic organisms. Studies were carried out in the Great Lakes, Hudson River, and the Middle Atlantic region, with several other nonregion-specific studies also underway. One quarter of the temperature stress studies concentrated on effects on boring and fouling communities. OTEC-related environmental studies funded by DOE accounted for about 35 percent ($460,000) of the Federal effort. Eight percent of the cooling water use studies focused on effects of impingement and entrainment on planktonic organisms, including larvae and eggs of fish and shellfish.

8. Microorganisms and Pathogens

The marine environment contains a wide variety of microorganisms. They range from true marine residents to terrestrial organisms introduced into the ocean via sewage, freshwater runoff, or by other means. Some microorganisms may be potential human pathogens or may harm marine aquatic species. Other organisms play a role in chemical degradation and transformation of pollutants that occur in the marine environment.

Nonmarine microbial agents and organisms that can cause human disease may appear intermittently in the marine environment, because of rainwater runoff or human waste disposal. While these species do not generally survive for long periods in the marine environment, certain nonmarine bacteria may multiply in exposed fish populations, thus posing a threat to humans of reinfection. Toxins from certain planktonic organisms (dinoflagellates) normally found in the marine environment may be accumulated in shellfish and cause paralytic shellfish poisoning in humans. A number of diseases of marine species are known to be caused by bacteria and other microorganisms introduced into the ocean. Some of these microorganisms cause high mortalities of free-living and cultured fish, shellfish, and other species.

Microorganisms are also extremely important to marine ecosystems because they assimilate, degrade, and transform to nutrients a variety of natural waste materials -- all processes that are essential to the viability of the marine ecosystem. In addition to this natural role in the cyclic turnover of all major elements necessary for life, microorganisms function in the degradation and transformation of pollutants. This latter role contributes in many instances to the continued health of the ecosystem. Thus, while microorganisms can be pollutants themselves, they also serve to mitigate the effects of other pollutants.

Federal research, development, and monitoring programs directly related to pathogens and microorganisms amounted to about $2.7 million in FY 1978. NOAA, EPA, DOI, and FDA spent these funds on pathogen-related studies and development activities. Thirty-one percent of the effort was directed to developing methods for measuring levels of pathogens in particulates, water, fish, and shellfish, and to developing and improving techniques and indices to assess levels of pollution, including the use of mollusks as in-situ pollution indicators. Twenty-one percent of the $2.7 million was used to fund studies on the effects of pathogens on fish, shellfish, and humans. Regional efforts included studies of the effects of pathogens on fish in Florida waters and on the causes of shellfish and larvae disease in Puget Sound.

Studies on human health related to swimming in recreational waters off Long Island, N.Y., and Lake Pontchartrain, La., are continuing. The objective is to set water qualtity criteria for public beaches. To develop immunization procedures, NOAA is funding a study on the health of divers working in polluted waters.

About 9 percent of the $2.7 million was directed to determining the behavior and fate of pathogenic bacteria and viruses in seawater. Study topics included research on inactivating mechanisms and on methods for removing pathogens from sewage before marine disposal. The remaining 39 percent (about $1.1 million) funded efforts to define the distribution and levels of pathogens in shellfish in the Gulf of Mexico and off east Florida and FDA's continuing shellfish sanitation program, which monitors levels of pathogens in shellfish collected for human consumption.

9. Chlorination Products

Chlorine is added to drinking water and wastewater for disinfection purposes. Chlorine and other biocides are used to minimize slime and other types of biofouling in heat exchangers at OTEC facilities, LNG regasification plants, coastal powerplants, and other industrial facilities. The chlorine interacts with organic materials in seawater to produce chlorinated substances, and these can then react with naturally occurring bromate ions to produce brominated organic compounds. Among the compounds formed are chloroform and bromoform, both of which have carcinogenic and mutagenic properties. The use of chlorine is expected to increase in the future; however, little is known about reactions between the chlorination process and organic materials in waste-water streams. Additional toxic substances may result from the treatment process, or pollutants may be converted to harmless forms.

Evidence does indicate that undesirable impacts on marine organisms are associated with introduction of chlorination products into the marine environment. Lethal effects have been found, and shellfish that have measurable uptakes of halocarbons (such as chloroform and bromoform) provide a potential route for these toxic substances to affect humans. Chlorine-treated wastewaters with no measurable chlorine residual have caused measurable shifts in the colonization and composition of exposed communities of marine algae.

About $1.3 million was spent in FY 1978 on studies of the fate and effects of compounds formed when chlorine is added to cooling water used in coastal powerplants. NRC funded 41 percent of this effort, and DOE and EPA the remainder. Roughly 50 percent of the work was directed toward identification of compounds formed and determination of reaction kinetics for chlorination byproducts. Remaining expenditures were for investigating toxic effects, including pathways and bioaccumulation, in marine and estuarine organisms. The program effort on chlorination products is expected to decrease by 50 percent through FY 1979 and 1980, with slightly increased emphasis on studies of the fates of the products.

10. Other Pollutants

Three other pollutants have been identified as possible problems in the marine environment -- litter, explosives, and brine. Litter encompasses a variety of insoluble substances: plastics and other synthetic organic materials, glass, metals, wood, petroleum products in the form of tar balls, grease balls, and natural organic matter. Litter is common and widely distributed on beaches, and can be found in coastal and open ocean waters, in or on bottom sediments, and in marine organisms. Its sources include recreational activities on land and at sea, ship discharges, industrial effluents, and sewage-related additions from the overflow of storm sewer systems and bypass of treatment systems.

Although litter has been found in the internal organs of marine biota, there is no clear evidence its ingestion causes morbidity or mortality. More serious are the deaths of sea birds and marine mammals, especially northern fur seals, which become tangled in floating derelict commercial fishing nets and ropes.

The fouling of beaches by litter is a major aesthetic problem. The cost of cleanup is high, and economic losses to beach-related industries can reach annual values of tens of millions of dollars. Few quantitative studies have been made on the types, fluxes, and persistence of litter.

Only one Federal project exclusively related to litter was identified in the project inventory made for this Plan. USCG is developing a solid waste incinerator for use by its vessels. This project was funded for $91,000 in FY 1978 and $290,000 for FY 1979. The Navy is pursuing similar work.

Explosives were also identified as an ocean pollutant. Primary concerns are related to disposal of waste materials from ordnance manufacturing operations, physical damage resulting from explosive testing in marine environments, and seismic shock effects resulting from geophysical surveying activities.

The U.S. Navy spent about $600,000 in FY 1978 on ocean pollution research, development, and monitoring related to ordnance and explosives. The program is expected to decrease to $439,000 by 1980. Almost half of the FY 1978 effort was directed at evaluating the extent of hazards to marine organisms from testing of explosives. The rest was used to develop treatment systems for removal of explosives residues from process plant waters and to develop systems for monitoring effluents from explosives plants.

DOE supported preparation of environmental impact statements for development of the Strategic Petroleum Reserve. DOE spent $2.3 million on this project in FY 1978. The effort addresses the spectrum of environmental issues associated with the development of a petroleum storage capability using salt dome formations along the U.S. Gulf Coast and focuses on the effects of brine disposal.

B. Effects of Ocean Pollution

This section of Chapter III of the Federal Plan discusses the key question that must be addressed by the Federal ocean pollution research, development, and monitoring program: What are the effects of ocean pollution? Obviously, this is really a complex of exceedingly difficult questions related to the effects of many pollutants, both singly and in combination with one another, on humans, marine living resources, and human use of the marine environment for recreational and aesthetic purposes. The questions, however, must be formulated, and as many of the answers as can be obtained within the constraints of scientific capability and fiscal limitations must be made available to decisionmakers in timely and useful fashion. This information on effects of pollution is crucial to rational regulation of polluting or potentially polluting activities and also for monitoring and effective response to polluting incidents. This section of chapter III first presents common needs related to pollution effects on human health, living resources, and recreational and aesthetic values. The section then identifies specific needs for each region of the country.

1. Human Health

Ocean pollution directly and indirectly affects human health. Water contact sports pose a threat if coastal waters are contaminated with pathogens or toxins. Contaminated drinking water can have serious public health consequences. Bioaccumulation and concentration of pollutants in marine organisms -- via trophic level transfers in the food chain -- pose a widespread threat to humans. Many of man's ocean use activities contribute to these threats. However, ocean pollution research, development, and monitoring in the human health effects area should be directed at the toxic effects of pollutants regardless of source. Areas of emphasis should include direct human health effects of pollutants and indirect effects resulting from bioaccumulation and trophic-level transfers in the food chain. Major needs in the human health area are:

- o Determine the health effects of microorganisms, synthetic organics, and other pollutants which reach man via the marine food chain
- o Identify, evaluate, and rank potential human health hazards resulting from ocean pollution
- o Determine the human health effects of direct contact with polluted waters.

2. Living Resources

Oceans and estuaries are the life-support systems for living marine resources. Fish, crustaceans, mollusks, aquatic plants, birds, and mammals serve human needs and desires related to nutrition, industrial and medicinal uses, education, and aesthetics. World commercial landings (including production from aquaculture) of marine and anadromous fish, shellfish and plants has more than doubled in the past 10 years. Commercial landings of edible species in the United States were 1.3 million metric tons in 1977, valued at a record $1.4 billion. More than 1 million metric tons of fish valued at $111 million were landed in 1977 for reduction to meal and other industrial uses. Most of the U.S. catch was taken in the territorial sea (0-3 nautical miles) or coastal zone.

Important recreational activities are also supported by living marine resources. In the United States in 1970, marine sport fishing alone took an estimated 715,000 metric tons of fish. The number of marine sport anglers increased from 6.3 million in 1960 to 9.5 million by 1970, and their expenditures increased from $626 million in 1960 to an estimated $1.8 billion in 1975.

The monetary value of our commercial and recreational fisheries is one measure of their worth to society. Beyond this, marine living resources have a significant intangible value, because of aesthetic considerations and their contribution to species diversity.

Marine pollution causes declines in commercial fishery stocks and decreases in levels of marine mammal populations and other aesthetically valued flora and fauna. Three types of pollution are primarily responsible for adverse effects on marine living resources:

- Loss of habitat
- Physical perturbations
- Chemical pollution

Loss of habitat occurs through gradual encroachment by population growth, industrial development, and recreational activities along the Nation's coastline. Areas once used for spawning, forage, and nursery grounds are lost or altered as industrial siting, dredging of navigation channels, dredging and filling for coastal development, mining, and lumbering activities accelerate.

This loss of habitat is especially critical in the southeastern United States and Gulf of Mexico where the major portion of commercial fisheries depends on estuaries. Southeastern Alaska with its salmon fishery and Chesapeake Bay with its blue crab fishery are also being increasingly stressed by loss of habitat. In these and other areas of the country, decisionmakers are faced with crucial questions of: (1) How much habitat can be destroyed while still sustaining fisheries; (2) How much and which habitats can be altered without irreparably damaging the overall ecosystem; and (3) What are the long range, cumulative effects of coastal development on living resources? In the face of these difficult questions, much of the Federal effort on habitat problems is reactionary and site specific, because of fiscal constraints.

Physical perturbations occur because of use of estuarine waters for powerplant and industrial process cooling and because of sediment deposition from coastal development and runoff. Use of cooling water elevates receiving water temperature and damages larval and juvenile fishes that pass through cooling water systems. Sediment deposition smothers and impairs vital functions of bottom dwelling organisms and can cause changes in community structure and habitat over the long term. Current work in the physical perturbation area tends to focus on localized, specific problems. An effort to view these effects in combination at the species population level is needed.

Chemical pollutants introduced by human disposal of wastes into the Great Lakes, estuaries, and the ocean stress living resources. Acute effects such as fish kills and bird mortalities caused by oil spills are readily apparent. However, subacute, long-term effects, such as diminished populations and changes in community species composition, are less obvious but potentially much more damaging. These long-term effects, which can affect as much as 30 percent of the individuals in some species found in highly polluted urbanized areas, result from uptake and transformation of hydrocarbons, synthetic organics, metals, and radionuclides in the marine food chain. These biological effects of chemical pollutants alter physiological, behavioral, genetic, and reproductive functions of living resources. Declines in valuable species result, and humans are ultimately exposed to unacceptable levels of pollutants, for example mercury and PCBs.

The factors influencing effects of chemical pollutants on marine biota are complex, and synergism, variability, mobility, and ecosystem interaction all complicate efforts to study the problem and develop adequate information on the ultimate effects of multiple pollutants on single species and the overall ecosystem. Common needs for ocean pollution research, development, and monitoring related to effects of pollutants on living resources are:

- Identify critical fishery and endangered species habitats.
- Develop information on fishery stocks and life stages dependent upon impacted coastal areas and assess the economic consequences of stock level decreases due to marine pollution.
- Develop predictive models for physical processes and cumulative effects that impact important habitats and ecosystems.
- Develop basic information on population size and life stages of selected estuarine-dependent species.
- Develop historical and current information on the physical processes of selected embayments and estuaries.
- Make projections of future sediment loads in key embayments.
- Develop information on the interaction between sediments and suspended particulates and chemical pollutants in the water column.

- Determine the acute effects of existing and new synthetic compounds on selected marine organisms.

- Perform laboratory and field studies on long-term chronic effects of toxic pollutants with emphasis on persistent compounds at sites with a long history of pollution.

- Develop strategies and experiments to address the effects of multiple contaminants (synergism and antagonism) on selected marine organisms.

- Perform studies on physiological processes of key marine biotic groups. Our understanding of these processes is essential to our assessment of pollution effects.

- Perform studies on bioconversion of pollutants. A critical link in determining the fate and effects of pollutants is our ability to track pollutants along ecosystem pathways.

- Make intensive studies of ecological systems, particularly those not yet severely affected by pollution. This information provides the standard for determining the relative effects of pollution.

- Identify early warning signs of damage to marine organisms caused by chronic pollution. Areas for further study are cellular and tissue examination of biota.

3. Recreation and Aesthetics

Recreation is one of the largest and fastest growing uses of the coastal zone. With 75 percent of our national population concentrated in 30 coastal States, there is tremendous demand for access to waterways and shoreline for recreational uses ranging from swimming, water skiing, boating, and diving to painting, wildlife observation, shell collecting, sun bathing, and simple enjoyment of the landscape. Swimming, boating, and fishing are the most popular recreational activities.

In estimating the potential damage from marine pollution, aesthetic values are often ignored, because it is difficult to quantify the benefits. However, the quality of the ocean environment is an intangible asset that belongs to everyone.

Common needs in the recreation and aesthetics area are:

- Determine the availability of and demand for marine recreational resources and estimate the value of those resources to society.

- Quantify the potential value loss to marine recreation from marine pollution, particularly petroleum and pathogens.

- o Identify regional and national public goals and values for marine recreation as it relates to other marine resource uses.
- o Identify and evaluate alternative multiple uses of coastal and ocean areas and potential conflicts between polluting activities and increased recreation.
- o Develop regional marine pollution indices that effectively communicate the quality of the marine environment to the general public.
- o Evaluate the importance of the aesthetic value of the marine environment, including the "contemplative" value of unspoiled natural habitats and the potential loss to this value due to marine pollution.

4. Special Regional Problems

Geographic differences in population density and landbased and marine activities that contribute to ocean pollution levels necessitate a regional examination of the problem to identify specific research, development, and monitoring needs based on pollution effects on human health, living resources, recreation, and aesthetics. To accomplish this more detailed analysis, the country has been divided into nine regions, and regional needs in ocean pollution research, development, and monitoring have been identified, along with a description of current levels of Federal activity. The regions used for analysis purposes are:

a. North Atlantic -- Canada-Maine Border (Northeast Channel) to Rhode Island-Connecticut border.

b. Middle Atlantic -- Rhode Island-Connecticut border to Cape Hatteras, N.C.

c. South Atlantic -- Cape Hatteras to Key West, Fla., including Puerto Rico and U.S. Virgin Islands

d. Gulf of Mexico -- Key West to Texas-Mexico Border

e. Pacific Southwest -- Mexico Border to Point Conception, Calif.

f. Pacific Northwest -- Point Conception to Washington-Canada Border

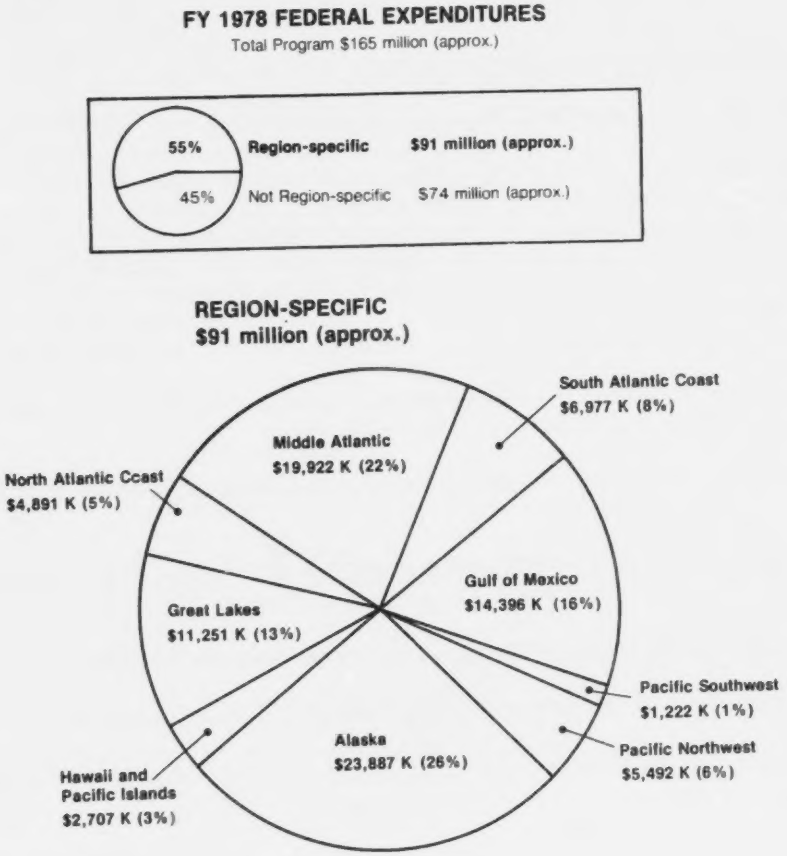
g. Alaska -- Gulf of Alaska, Bering, Chukchi and Beaufort Seas.

h. Hawaii and Pacific Islands

i. Great Lakes -- Lakes Ontario, Erie, Huron, Michigan, Superior, and the Saint Lawrence River.

This division enabled development of a statement of regional needs recognizing such differences as the problem of Middle Atlantic waste disposal, development of Gulf of Mexico and Alaska oil and gas, and the problems of eutrophication and PCBs in the Great Lakes. The Federal response is also focused regionally in many cases. However, that focus is usually informal and ad hoc. A stronger regional emphasis is one approach that may increase the utility of the program in future years.

Regionally oriented programs accounted for approximately $91 million or 55 percent of the fiscal year 1978 Federal expenditure of $165 million on ocean pollution research, development, and monitoring. Figure 2 shows how these funds were distributed among the coastal and Great Lakes regions of the country.



— FY 1978 Federal Program for Ocean Pollution Research, Development and Monitoring: Regions

a. North Atlantic Region

The North Atlantic region, from the United States-Canada border (Northeast Channel) to Connecticut, is noted for its recreational importance. It has a scenic, rocky coastline in the north and wide sandy beaches along Cape Cod. The area is characterized by narrow, deep, and open inlets, cool fertile waters, and large tidal ranges. Heavy spring runoff locally dominates coastal circulation, but natural erosion and sedimentation are not severe problems. Due to early historic development and dependence upon marine resources, the North Atlantic region has a high concentration of Federal and academic marine research facilities.

The area sustains important commercial fisheries for lobsters, clams, and scallops, and the especially productive fisheries for cod, haddock, herring, and flounder. Most of these fisheries are not heavily dependent on estuaries. However, two formerly important North Atlantic fishery species (Atlantic salmon and sturgeon) are estuarine dependent and are now rare or endangered.

Marine pollution is at present confined primarily to relatively localized areas, with estuarine modification being the most pronounced problem, particularly in the Boston, Mass., Providence, R.I., and Portsmouth, N.H., areas. Well-developed ocean circulation and strong tidal currents provide a tremendous flushing capacity to this region and tend to mitigate the effects of pollution. However, local concerns are expressed over the present impact of lumbering, and municipal waste disposal, and the possible effects that oil and gas development will have on fisheries, recreational quality, and air and water quality.

NEEDS

Georges Bank Oil and Gas Exploration. Assess and monitor the probable effects on local ecosystems and fisheries of impending exploration and development of oil and gas on Georges Bank.

Spill Vulnerability Assessment. Classify coastal areas according to their vulnerability to spills of oil and hazardous chemicals. Such information, particularly with respect to high value recreational areas and rare and endangered species habitats, is needed for contingency planning for response to pollution incidents.

Powerplant and Oil Refinery Siting. Assess proposed sitings of coastal powerplants and oil refineries by performing surveys and effects research and developing conceptual and numerical models.

Waste Disposal. Assess the environmental impacts of waste disposal near major coastal urban centers.

ANALYSIS

The total Federal effort on ocean pollution research, development, and monitoring in the Northeast Atlantic coastal region for FY 1978 was about $4.9 million. The bulk of this effort, $3.77 million (77%), was directed toward assessing possible effects of impending offshore petroleum development in the Georges Bank area. A total of $0.8 million (16%) was spent on studying the environmental impact of urban waste disposal. Spilled oil research received $0.2 million (4%) in Federal funding. Research on effluents from coastal powerplants was funded at $0.07 million (1%).

Most of the DOI/BLM effort in the North Atlantic region, $3.48 million (71.6%), was directed at problems associated with offshore petroleum development. EPA funded studies related to offshore petroleum development for $0.2 million, research on powerplants for $0.04 million, spilled-oil activities for $0.2 million, and urban waste disposal activities for $0.15 million, for a total of $0.6 million. NOAA funding, in the amount of $0.48 million (10%), was directed toward urban waste effects ($0.44 million) and a Sea Grant study of coastal powerplant wastes ($0.03 million). The Ocean Power Program, a long-term research and monitoring study, is planned to begin in 1979. DOE funded a total of $0.2 million in North Atlantic research activities, of which $0.125 million was for studies of trace metal cycling in sediments and $0.067 miilion was studies related to offshore petroleum development.

The major causes for concern in the northeast Atlantic coastal area are the possible reductions in fishery resources and recreational amenities that might be brought about by offshore petroleum development. Potential environmental impacts and geological hazards have been under evaluation for several years in areas where oil and gas lease sales are expected. The present Federal program appears to respond to this need adequately. Future efforts should be reevaluated, and if the likelihood of petroleum production in the area decreases, program emphasis should change accordingly.

Programs to assess damage from oil spills are inadequate; however, efforts to develop information necessary for adequate programs are underway within EPA, NOAA, DOT, and the USCG. Although this problem has been highlighted in the North Atlantic region, because of interest in Georges Bank development, it is a problem applicable to all regions.

A relatively low level of Federal funding is directed at waste-disposal problems, and the studies do not address urban centers equally. State efforts should be assessed, and the Federal program should be redirected in accordance with demonstrated local need.

While Federal agencies are concerned with the pollution threat imposed by powerplant effluents, utility companies carry on most of the environmental work in this area. The inventory of programs associated with this Plan does not include sufficient information upon which to assess Federal efforts to overview the adequacy of these private studies.

b. Middle Atlantic Region

The region from Long Island to Cape Hatteras has been heavily affected by urbanization and industrialization of the coastline from New York to Washington. Its major estuaries --New York Harbor/Raritan Bay, Delaware Bay, and Chesapeake Bay -- have undergone considerable degradation as a result.

Despite its myriad pollution impacts (municipal waste discharge, toxic waste disposal, dumping of sewage sludge, massive urbanization, coastal modification, etc.) the area still supports active outdoor recreational activities along its scenic coastal beaches, outer banks, inner marshes, and estuaries. Chesapeake Bay, one of the world's largest estuaries, is particularly noted for its recreational attractions. It also provides wintering grounds for great flocks of ducks, geese, and whistling swans. The Bay sustains two of the most important regional commercial fisheries, oyster and blue crab, the latter being the largest fishery of its kind in the world. However, productivity of the Bay is endangered by increased runoff, sedimentation, erosion, waste disposal, dredging, industrialization, and transportation-related pollution.

In the New York Bight area, the adverse effects of human activities have reached such a degree that they have sparked vocal public concern over potential hazards and degradation of the environment. Events such as the fish kill of 1976 (caused by bottom-water anoxia) and the closing of Long Island beaches (because of washup of sewage wastes including grease and tarballs) have increased the public's awareness and demands for action.

Long-term effects of polluting activities on the estuaries of this region, particularly the New York Bight, are not well understood. Perceptible changes, such as tainting of seafood organisms and higher incidence of fish and shellfish disease, are indicators of the deleterious effects of toxic metals, PCBs, and other polluting substances. Decreases in the striped bass population may be attributable to pollution-related problems. OCS oil and gas exploration is being conducted in the area, and there is concern over potential impacts of these activities on the marine ecosystem.

NEEDS

New York Bight Area. Develop sound comprehensive information upon which to base future environmental, resource, and waste-managment decisions in the New York Bight area. This should include scientific, economic, and social information. The generation of realistic but effective environmental recommendations concerning ocean outfalls, ocean dumping, and dredging is imperative, if the degradation of the environmental quality of the estuary and the adjacent waters is to be halted. A comprehensive, coordinated scientific program is needed to ensure proper direction of the needed efforts.

Chesapeake Bay Assessment. Perform a comprehensive assessment of Chesapeake Bay to determine the long-term viability and sustenance of this system. Research and monitoring on the effects of agricultural and urban runoff, sedimentation, nutrients, and sewage on the estuary's biota, particularly through its aquatic vegetation, is needed in order to protect this important natural habitat and/or derive optimal socioeconomic benefits from its resources.

Delaware Bay. Perform a comprehensive assessment of the impacts of oil transportation and refinery operations on the health of Delaware Bay ecosystems. Delaware Bay contains one of the largest concentrations of oil processing operations in the United States.

Industrial Dumpsite (DWD106). Continue monitoring activities in this area to assess impacts on the health of the local ecosystem. Several industries have permits to dump industrial waste at deepwater dumpsite 106, which is 90 miles east of Cape May, N.J.

Environmental Monitoring. Develop a system for monitoring not only the water quality but the long-term fate and effects of pollution. This coastal region, particularly around the New York Bight and Chesapeake Bay, has undergone substantial environmental degradation.

OCS Oil and Gas Development. Determine the impact of developing outer continental shelf oil and gas. A thorough assessment of all development-related activities affecting the area must be made so that appropriate protective or prohibitive measures can be developed. This should include surveys, research, monitoring, and modeling of the offshore and coastal systems.

Evaluation of Past Long Island Sound Studies. Evaluate past studies in Long Island Sound to determine long-term trends (50 years) in the impact of human activities on this body of water. Attention should be given to evaluating the extent to which sewage and other materials can be disposed of in open water and the consequences of these actions on the living resources of the region.

Assessment of Fish and Shellfish Stocks. Continue assessment and monitoring for contamination of fish and shellfish harvested from the area as well as from aquaculture projects. These activities must continue to protect the public from contaminated seafood.

ANALYSIS

Federally funded marine pollution research, development, and monitoring activities in the Middle Atlantic coastal region were at a level of

$19.9 million in FY 1978. The area centered around the New York Bight received $5.5 million (29%), Chesapeake Bay received $5.8 million (31%), and efforts related to development of outer continental shelf oil and gas development were funded at $4.5 million (24%). Comprehensive monitoring of water quality and long-term effects of pollution has not been initiated, and Long Island Sound related pollution efforts received only $0.03 million in Federal funding (0.1%). Monitoring of shellfish harvesting areas received a portion of FDA's $2 million national shellfish monitoring program.

DOI/BLM funded the offshore oil and gas development related studies at $4.5 million (24%). DOI/USGS funded ecological studies in the New York Bight region at $0.6 million (3%). DOC/NOAA funded ecological and other pollution related studies in the New York Bight region, including ocean dumping studies, at $4.7 million (25%), in the Chesapeake Bay region at $0.12 million (0.6%), and in Long Island Sound at $0.03 million (0.1%). EPA funded the bulk of the Chesapeake Bay studies at $5.4 million (28%), and funded investigations related to ocean dumping at a level of $1.5 million. HEW funded the national shellfish safety monitoring program, a portion of which was carried out in this region. DOE funded offshore studies related to oil and gas development in the area at $0.6 million (3.2%). DOT/CG contributed 0.25 million (1.3%) to monitoring efforts, and NASA funded monitoring related efforts at $0.3 million (1.6%). NRC funded studies related to nuclear powerplant effluents at a level of $0.1 million (0.5%).

The review of the current Federal programs in the Middle Atlantic region indicates that the funds for the three major needs, studies related to New York Bight, Chesapeake Bay, and OCS oil and gas development, are nearly equally distributed and seem adequate for these areas. The major gap is the lack of a monitoring program that would look at not only those three areas, but would extend to cover the entire region. Additional studies on potential environmental impacts and geological hazards may be needed for future oil and gas lease sales. A review of existing State programs will be necessary to assess the level of Federal agency involvement in Delaware Bay and Long Island Sound studies. The current program does not take advantage of the numerous past studies that have been carried out in Long Island Sound.

c. South Atlantic and Caribbean Islands Region

The South Atlantic Region, from Cape Hatteras, N.C., to Key West, Fla., including the Virgin Islands and Puerto Rico, is undergoing increased coastal development and land use. This region includes environments ranging from temperate to subtropical. The massive estuarine system defined by the barrier islands and marshes along the mainland coast supports over 80 percent of the important commercial fisheries in this region at some stage in their life cycle. The major concern relating to the mainland is the continual loss of estuarine habitat to coastal development. With respect to the Virgin Islands and Puerto Rico, there is concern about the need to use the ocean for waste disposal and the potential consequences of sand and gravel mining.

The estuaries of the region are subject to the destructive forces brought about by increased population pressure -- dredging, filling, channelization, and dredged material dumping. These pressures occur as navigation is improved, as commercial and residential land is developed, and as refuse is disposed of. All these activities cause virtually total destruction of marsh habitat, as the marsh is filled with silt, sand, or refuse to an elevation that restricts the tidal flow necessary for ecosystem survival.

Another major stress on the estuarine systems in the region is nonpoint-source pollution from agricultural runoff. This input coupled with pollution from industrial outfalls and soil erosion poses threats to the environmental quality of the area.

Few studies are available on the specific effects of these stresses on wetlands. Although it might be possible to synthesize a model from available data to describe the effects of certain stresses on the system, the goal is still far removed. OCS oil and gas exploration has just begun in the area and may expand, causing additional stress on the coastal environment.

NEEDS

Estuarine Ecosystems. Develop an understanding of estuarine ecosystems and their links with oceanic fishes. This should be achieved through a comprehensive research program including laboratory and field studies directed at developing ecosystem models. These models should include placement of values on different habitats in estuaries. Such models are needed in order to determine the extent to which habitats can be stressed before ecosystem balance is altered. Focusing on several selected habitats would be the most cost effective approach for such a large area.

Nonpoint Sources of Pollution. Perform comprehensive studies, using the approach described above, to determine the fates and effects of nonpoint-source inputs arising from activities such as logging, urban development, and agriculture in selected estuarine systems such as those around Savannah, Ga., Charleston, S.C., and the barrier island system.

OCS Oil and Gas Development. Evaluate the potential impact of OCS oil and gas development on areas such as the Blake Plateau and Georgia Embayment. A thorough assessment of all development-related activities impacting the area must be accomplished in order that appropriate prohibitive or protective measures can be developed. Particular concern should be given to the effects of OCS activities on estuarine-dependent fisheries, offshore shellfish beds, and reef areas.

Oil Spills and Discharges Off Southern Florida. Undertake selected studies on impacts of oil spills and operational discharges on coral reefs, seagrass beds, mangrove habitats, and recreational resources off southern Florida. Studies on the degree of ecosystem recovery after these inputs are controlled should also be performed.

Sand Dredging Near St. Thomas, V.I. Assess the environmental implications of offshore sand dredging near St. Thomas and determine the effect this may have on near-shore biota.

Impact of Oil Refineries in St. Croix. Assess the impact of two major refineries to determine possible effects on sensitive coral reef systems.

Coastal Land Use Activities. Assess present and projected trends in coastal land uses including recreation, agriculture, and industrial development.

Thermal Discharges in Florida. Evaluate the effects on ecosystem diversity and stability of cooling water discharges from coastal industrial facilities and powerplants.

Habitat Preservation of Endangered Species. Perform a comprehensive study of the degree of habitat preservation (through designation of refuge areas, limited access areas, etc.) required for the survival and propagation of endangered marine species. Emphasis should be placed on ocean turtles and manatees as two species particularly affected by coastal development.

ANALYSIS

Marine pollution-related research, development, and monitoring activities identified as specific to the U.S. Southeast Atlantic region, Puerto Rico, and U.S. Virgin Islands were funded at $7.0 million in FY 1978. Of this total, about $2.6 million (41%) was devoted to studies of OCS oil and gas development, and about $1.8 million (30%) to concerns about estuarine modification and habitat protection. Other study areas involved fate and effects of nonpoint pollutants, oil spills, and ocean disposal of pharmaceutical wastes off Puerto Rico.

Present activities also include projects devoted to safety of seafood ($239,000) and studies by DOE of powerplant sites in the coastal zone ($1,663,000). This sum is about 30 percent of the expenditures in the region.

At present, no program addresses the problems of sand and gravel mining in the Virgin Islands. The level of effort indicated as going toward studies of estuarine habitat and ecosystem modification studies ($676,000) may not be adequate to fully address problems in that area. Some research related to habitat modification may be supported by local funding sources and thus may not be reflected in the inventory of Federal projects in the South Atlantic region.

d. Gulf of Mexico Region

The Gulf of Mexico has many important natural resources, including the diverse intertidal environments where water and land meet. This land/water interface provides habitat for fish and wildlife and presents a unique setting for recreational pursuits. The extensive shoreline consisting of barrier islands, beaches, estuaries, bays, sounds, and tidal marshes supports numerous water-related outdoor leisure activities. The diverse bird life of the region includes such rare or endangered species as the whooping crane, southern bald eagle, greater sandhill crane, and Cape Sable sparrow.

The dominant feature of the Northern Gulf is the Mississippi River Delta with its vast area, great river channel and flow, intricate network of lesser channels and bayous, and numerous lakes, bays, marshes, estuaries, and islands. Notable also are Tampa, Mobile, and Galveston Bays, the elongate complex of bays, marshes, and islands of the western Texas coast, and the estuaries and barrier islands of Florida, Alabama, Mississippi, and Texas.

Most coastal zone land in the Gulf region has been developed for agriculture, woodland timber, urban, industrial, residential, recreational, and transportational uses. Population growth rate along the Gulf coast is greater than the U.S. average, particularly along the East Texas coast (Houston metropolitan area) and the Tampa Bay area of Florida.

An important natural resource of commercial value is the fishery industry. In 1976 the Gulf States offshore fishery accounted for 33 percent by weight and 29 percent by value of total U.S. fisheries. On a worldwide basis, the fishery yield of the Gulf, particularly the northern area, is second only to that off the Peruvian coast. The most productive fishery region of the Northern Gulf is around the Mississippi Delta. About 30 to 40 percent of the Gulf fisheries catch is taken on the eastern side. The Gulf fishery is dominated by shellfish (shrimp, crabs, and oysters and smaller catches of clams and scallops), which generally is three or four times more valuable than the much greater volume of finfish (menhaden, mullet, snapper, and others) landed. The commercial fisheries catch of the Gulf States is dominated (97.5%) by estuarine-dependent species (fish or shellfish that spend all or part of their lives in estuaries).

As of March 1977, 7.8 million acres of coastal and offshore area in the Gulf was held under active lease for petroleum production. Of this acreage, 42 percent is now producing, mostly in offshore Louisiana and Texas. As of February 1979, more than 16,000 exploration and development wells were drilled in the Gulf of Mexico OCS area, and more lease sales are expected.

The Gulf is the site of numerous nearshore dumpsites for dredged material and has been the site for disposal of toxic chemical and industrial waste. The Gulf also was the location for experimental shipboard incineration of organochlorine wastes. Consideration is being given to using an offshore oil rig as an incineration site for hazardous materials. The diversity and extent of human activities in the Gulf have placed heavy demands on the region's resources.

The most significant source of pollution in the Gulf is outflow from the Mississippi River, which drains more than 5.5 million km^2 or 41 percent of the lands of the continental United States. The sediments in the Mississippi Delta area have high levels of organic pollutants. Until recently, this source of pollution has been overlooked, and its impact on the marine resources of the Gulf is little understood.

NEEDS

Nonpoint-Source Pollutants From the Mississippi River. Establish a scientific program to determine the effects of nonpoint-source pollutants, especially those carried into the Northern Gulf by the Mississippi River. The waters, sediments, and biota of the Gulf receive large quantities of toxicants from nonpoint sources. Their fates and effects, especially in the human food chain, need to be identified.

Long-Term Effects of Petroleum Development. Conduct a post assessment program to determine the long-term (more than 25 years) effects of petroleum development on living resources, and the offshore and nearshore environment. Thorough chemical, biochemical, and geological analyses of the significant constituents of the biota, water, and sediments are needed for historical ecological comparisons.

North Central Gulf Wetland and Estuarine Assessment. Make a comprehensive assessment on the effects of wetland and estuarine modification along the North Central Gulf coast. Freshwater inflow into estuaries has been altered because of urban development and modifications in river flow. Information is needed on the cumulative effects of freshwater inflow, channeling, dredging, filling, spoiling, and oil and gas exploration in the massive wetlands areas. The extent to which physical alteration can continue before productivity of the ecosystem is permanently impaired must be evaluated.

Petrochemical Industrialization of Galveston Bay and Texas Coast.

Perform a long-term assessment, and determine what steps are needed to protect the aquatic environment and public health. The long-term effects of increasing petrochemical industrialization on Galveston Bay and the Texas coast are not well understood.

Development in West Florida Coastal Embayments. Make a comprehensive study to determine the long-range effects of increasing coastal development on West Florida coastal embayments and offshore fishery habitats. To what extent can an area, such as Tampa Bay, assimilate the impacts of urbanization and industrialization?

Disposal of Brine From Salt Dome Storage Sites. Monitor and study the dispersion of brine and its effects on marine biota as it is discharged from the salt dome storage sites of the Strategic Petroleum Reserve.

Drilling Mud Discharges on the Flower Garden Banks. Undertake monitoring and assessment of the effects of drill-mud discharges and other OCS-related activities on the Flower Garden Banks. The Banks are a unique recreational and marine wildlife habitat in the offshore Gulf waters and are being considered for designation as a marine sanctuary.

Effects of Ocean Outfalls. Investigate the ecological implications of waste disposal via point-source ocean outfalls along the Gulf Coast.

ANALYSIS

Research and monitoring programs dealing specially with coastal and offshore Gulf of Mexico waters received over $14 million in Federal funds in FY 1978. Oil and gas development and production has been a major coastal and offshore activity for many years. Funds related to studies of this activity were nearly $7 million, or one-half the total for the region. In addition to this Federal interest, significant study efforts were directed at offshore brine disposal from Strategic Petroleum Reserves ($2.5 million) and problems of wetland alteration and use (about $1 million).

The study of pollution related to oil and gas operations is supported for the most part by the Department of the Interior (DOI/BLM) and EPA. Both agencies are funding studies to assess long-existing oil fields off Louisiana and Texas, respectively. Total funding for these efforts is about $2.5 million. Projects to study effects of drilling muds on biota, and to conduct reconnaissance and monitoring of unique and sensitive environments (e.g., the Flower Garden Banks) amount to over $2 million. Three other ongoing environmental surveys funded by DOI/BLM total nearly $1 million.

The Department of Energy is spending $2.5 million for studies dealing with research and monitoring on the effects of offshore disposal of brine from onshore salt domes. Brine disposal studies and evaluation of OCS oil and gas activities are the principal Federal programs in the Gulf.

The Army Corps of Engineers is studying problems of wetland and estuarine alteration. Several individual projects are funded through the NOAA Sea Grant Program. Of the combined Federal effort (over $1 million) in wetlands modification, about $400,000 is for development of an information base (DOI/FWS).

Problems related to ocean dumping of municipal and industrial wastes in the Gulf of Mexico received nearly $400,000 through various NOAA-funded projects.

Several projects are addressing the distribution and effects of pesticides and trace metals along the coast and in the estuaries. Fishery products are being monitored for contaminants. Total funding for these studies is less than $1 million and is provided by several Federal agencies.

Problems associated with the coastal development of West Florida and pollution of Galveston Bay have identified FY 1978 funding of about $200,000 and $100,000, respectively.

In terms of funding level, the above-listed needs receiving the greatest and most concerted effort in the Gulf of Mexico are the post-assessment studies of petroleum development; research and monitoring of salt brine disposal; and effects of drilling muds, particularly with respect to Flower Garden Banks. The adequacy of these efforts must be judged in the future; however, coordination between programs is essential now.

Mississippi River outflow presents many problems that require study. In FY 1978 no major program was addressing the capacity of the Gulf of Mexico system to handle pollutants carried by the river. Several individual projects addressed the various pollutant components found in the Mississippi or in neighboring estuaries, but these studies are considered inadequate to assess synergistic and cumulative effects.

Projects assessing wetland modification are inadequate in scope or magnitude to define the problems arising from these pressures and stresses on this system. A concerted, coordinated effort is needed. Evaluation of the adequacy of wetlands modification studies is impaired by lack of information on State-supported programs.

Galveston Bay is the site of considerable industrial and municipal activity. Funding devoted to study of the impact of these activities was insignificant in FY 1978. Efforts to assess the impact of development of West Florida coastal areas also appear to be insignificant.

Ocean dumping activities in the Gulf, except for dumping of dredged materials, have stopped, and past research has shown no discernable impact from these activities.

e. Pacific Southwest Region

The Pacific Southwest Region (Mexico/California border to Point Conception, Calif.) is characterized by a narrow continental shelf and a continental borderland off southern California. Because of the narrow continental shelf, cool, fertile waters upwell near the coast for several months of the year as winds force the California Current offshore. The coastline has a typical beach and bluff configuration and only a few shallow embayments.

Southern California is densely populated with large areas of concentrated industrial development. Recreation, shipping (particularly petroleum transportation), oil and gas development, and municipal and industrial waste disposal are intense in this region. Commercial and sport fisheries, bird and mammal migration routes, kelp beds, and recreation areas are the major resources at risk.

There is a high level of ecological awareness and environmental concern in the Pacific Southwest Region. This concern is reflected in extensive State and local programs designed to provide the best balance between commercial development and preservation and enhancement of environmental quality.

Oil and gas exploration and development activities currently take place in the region. Additional lease sales are expected.

NEEDS

Petroleum and Mineral Development. Assess the impacts of pollutants associated with petroleum development. Pollutants associated with energy, and mineral development, transport, and use will increase in importance and warrant close scrutiny. Southern California is being considered as a port of entry for Alaska oil, liquefied natural gas (LNG), and as a site for new offshore oil drilling.

Nonpoint Source Impacts. Determine the effects of nonpoint-source pollutants on coastal ecosystems and evaluate the contributions from agricultural chemicals, runoff, aerial fallout, and vessel wastes.

Effects of Ocean Outfalls. Continue investigation of the ecological implications of waste disposal via point-source ocean outfalls in southern California.

Impacts of Geohazards on OCS Petroleum Development. Examine the potential impacts of geohazards on OCS petroleum development.

Impacts of OCS Petroleum Development on Critical Habitats. Assess the potential impacts of OCS petroleum development on critical offshore habitats, particularly in the Channel Islands, Santa Barbara Channel, and Tanner/Cortes Bank areas.

ANALYSIS

Existing programs address the impacts of OCS oil and gas development on offshore critical habitats, the impacts of pollution associated with energy development, and the impacts of petroleum transshipment activities on the southern California environment.

The total Federal expenditure for the region in FY 1978 was $1.2 million. Of this, nearly 60 percent ($666,000) was spent to address and evaluate potential pollutant impacts of OCS petroleum development on critical offshore habitats, particularly the Channel Islands, Santa Barbara Channel, and Tanner/Cortes Bank area. The Environmental Protection Agency funded a project (at $200,000) to establish a complete environmental data base for the Santa Barbara oil-lease area and to determine the effects oil extraction and transport will have on coastal ecosystems. Another significant effort addressing this need is a DOI/BLM-sponsored project (funded at $546,000), which will provide a biological characterization and geological reconnaissance survey of the areas of current and proposed oil and gas leases in the Southern California Bight.

Another study addresses erosion and transport of sediments and pollutants on the San Pedro shelf off southern California. This project is funded at $224,000, about 30 percent of FY 1978 funding for the region. It specifically addresses the first need, the potential impacts of new OCS drilling operations on the nearshore environment.

Other activities in the region (<10%) address nonpoint-sources of pollutants and geohazards associated with OCS drilling and pipelines. One study, funded at $33,000, addressed the effects of thermal effluents on biota; however, cooling water use was not identified as a regional concern.

The regional concerns about effects of nonpoint-source pollutants on coastal ecosystems and ecological implications of pollutants from point-source outfalls off San Diego, Santa Monica, and Santa Barbara may not be given proper support. Although considerable work has been done in the past to assess the potential impacts of transshipping Alaska crude oil to West Coast ports, this work should be coordinated to provide an overall assessment.

f. Pacific Northwest Region

The Pacific Northwest Region, Point Conception, Calif.,to Washington/Canada border, has a continental shelf and coastal configuration similar to the Pacific Southwest. However, ocean water temperatures are lower, and movement of the California Current away from the coast is less pronounced. Because of greater rainfall, major rivers cut through the coastal mountains to form deeply embayed estuarine systems. Extensive erosion and sedimentation have produced the wide tidal flats, bars, marshes, and shoals typical of the Pacific Northwest coastal systems. With the exception of San Francisco Bay, Tomales Bay, Coos Bay, and Puget Sound, river effluents tend to be carried directly offshore.

The Strait of Juan de Fuca and Puget Sound, which were glacier formed, do not have severe erosion problems and have retained much of their original configuration. The Strait and Puget Sound are a classiical estuarine system and a potential site for pollution problems, particularly if the area is chosen as a transshipment point for Alaska oil.

Fisheries of importance in the Pacific Northwest region include five species of Pacific salmon and many other anadromous and marine fishes and shellfish. Harbor porpoises, sea lions, and harbor seals are common marine mammals. Sea otters have been reintroduced to the coastal waters of Washington and form a healthy population. The rare humpback whale frequents bays and estuaries in the region.

The Region has a number of effective environmental programs, but it is not free of pollutants and their impacts. There is concern about discharges of industrial and municipal effluents into the waters of San Francisco Bay and Puget Sound and their input rates, fates, and effects. Discharges of wastes from various sources (including pulp and paper mills in Puget Sound) subject the estuaries to a variety of chemical compounds that are potentially detrimental to the marine biota and humans. Some of the contaminants have a direct and obvious impact on biota (especially at higher concentrations). Others have a more subtle, indirect effect. Some have no discernable effects at present concentrations but may have chronic effects if introduced over a long period.

The possibility of future development of OCS oil and gas is uncertain at present; however, lease sales have been scheduled for the area.

NEEDS

Effects of Complex Pollutant Mixes on Sensitive Habitats. Identify and assess the impact of complex pollutant mixes on sensitive habitats of migratory marine species. A well coordinated effort is required to identify and control pollution of the coastal habitats of marine species (especially birds, mammals, and anadromous fish) in the Pacific Northwest. Continued health of these species depends on identification and protection of habitats used throughout their migration paths.

Effects of Effluents on Puget Sound and San Francisco Bay. Identify and characterize the major marine components and processes of the Puget Sound and San Francisco Bay ecosystems that are affected impacted by environmental problems related to industrial and municipal effluents.

Petroleum Development. Examine the potential impact of OCS petroleum development and transshipment on sensitive coastal habitats and identify potential geological hazards.

Monitoring the Farallon Islands Low-Level Radiation Disposal Sites. Continue monitoring of the disposal sites for low level radiation near the Farallon Islands to assess dispersion, accumulation in biota, and possible transfer of these pollutants to humans.

San Francisco Bay Dredge and Fill Activities. Perform a study of historical, current and planned dredge and fill activities in San Francisco Bay and describe the ecosystem impact of these coastal alterations.

ANALYSIS

The total FY 1978 Federal effort in the Pacific Northwest Region exceeded $5 million. About two-thirds of this effort was directed to specific regional needs, i.e., the Puget Sound ecosystem, $1.4 million; the San Francisco Bay ecosystem, $0.8 million; OCS geohazards, $0.4 million; and habitats of migratory species, $0.2 million (all wetlands research).

Several DOE studies, for a total of about $1.0 million, dealt with the fate of sediments and associated radionuclides in the Columbia River estuary and local coastal waters. Physical, chemical, and biological processes in the coastal waters and their effects on the fate of Columbia River materials are part of the DOE program.

Other small efforts include ecosystem chracterization, the "mussel watch" program, and studies of carcinogens in marine invertebrates.

The USGS conducts the major studies of the San Francisco Bay, which focus on the circulation, sedimentology, and geochemistry. EPA and NOAA provide major support for Puget Sound efforts.

The Puget Sound program addresses regional needs and is a well-balanced multiagency effort. The San Francisco Bay effort appears to lack a program element dealing with fates of pollutants and their effects on living resources, although State and local programs may address this need. There are minimum efforts devoted to the OCS program. However, sales of OCS oil and gas leases have been scheduled within the next 5 years. Efforts to assess the effects of pollutants on critical habitats of migratory marine species are minimal and restricted to wetlands research.

g. Alaska Region

Alaska's extensive coastline (over half of the U.S. total) and corresponding coastal estuarine systems are among the State's most important resources. These coastal waters are mostly in a pristine state, as yet unaffected by pollution, and they serve as productive nursery, spawning and feeding grounds for valuable stocks of marine and anadromous finfish and shellfish. Large populations of many species of marine mammals and sea birds also depend on Alaska's coastal habitat. The fishing industry is an important source of State revenue, second only to oil and gas production, and is the largest industry in terms of employment.

Increased petroleum production and transport of oil products through Alaska's coastal waters have increased the risks of pollution. Many more sales of oil and gas leases are anticipated. Minor pollution problems that are evident include impact of wastes from municipalities and from the petroleum, timber, pulp and paper, and fishing industries.

Oil has not significantly polluted of Alaska's coastal systems. The most immediate problems appear to relate to the 800-mile Trans-Alaska pipeline, which brings oil from the oil-rich North Slope to the ice-free tanker terminal at Port Valdez in south-central Alaska. The coastal ecosystems in the region are particularly vulnerable, especially Port Valdez, Valdez Arm, and other systems in Prince William Sound.

Among Alaska's most important industries, now and in the future, are those involved with its forests -- their harvesting and processing. Coastal pollution problems originating from the logging industry are apparent in southeast Alaska. Discharge from pulp mills have seriously affected water quality in certain southeast Alaska bays. Serious degradation of water quality caused by inadequately treated wastes from pulp mills in Ward Cove and Silver Bay has been documented.

Wastes from the fish processing industry also have caused serious degradation of water quality in certain areas with inadequate tidal flushing. Only isolated cases of decline in water quality caused by the discharge of municipal sewage into the sea have been documented.

NEEDS

Ice Damage in the Beaufort and Chukchi Seas. Determine the potential for ice damage to nearshore structures and pipelines in the Beaufort and Chukchi Seas. In the nearshore zone, there are many pressure ridges in the fast ice. Ice regularly presses against and overrides beaches by as much as several tens of meters in some areas. Gouging of the ocean floor by the keels of pressure ridges and ice islands is also a potential hazard.

Cleanup of Oil Spills in Ice-Covered Regions. Develop the necessary technology to control and clean up oil spills in ice-covered regions. Effective cleanup may be possible in summer if little ice is present. Additional development of equipment and techniques for recovering oil in areas where ice is present is needed.

Petroleum Degradation by Microorganisms. Determine the role of microorganisms in degrading petroleum in Alaska coastal environments.

Petroleum Development Effects on the Bowhead Whale. Evaluate the threat to the bowhead whale of petroleum development in Alaska waters. There are great uncertainties about the endangered bowhead population, its reproductive cycle, migratory routes, and overwintering range.

Although possibly not threatened by low concentrations of oil, the bowhead whale population may be threatened by humans and their activities.

Pollutant Effects on Sensitive Habitats. Assess and predict the potential effects of pollutants on sensitive habitats. For example, the ice edge has been shown to be biologically important and is likely to concentrate and trap spilled pollutants in its many leads and irregularities.

Coastal Industrial Wastes. Determine the effects of pulp mill, fish processing, and other industrial waste effluents on water quality and ecosystems.

Logging in Southeast Alaska. Determine the effects of the clearcut logging practice on marine and anadromous fishery habitats and formulate effective methods for reducing impacts.

Geological and Physical Hazards. Study the effects of geological hazards on shipping, structures, and pipelines, particularly in Cook Inlet, Prince William Sound, and the Beaufort Sea. Although experience with offshore oil development in the northern part of Cook Inlet has shown that environmental hazards that are less destructive than major earthquakes can normally be dealt with, it is clear that Cook Inlet structures and pipelines will be subjected to strong tidal currents, high rates of sediment movement, seismic activity, and the action of ice during the winter. Petroleum transport and storage activities in Prince William Sound are vulnerable to seismic activity, ice hazards, and tsunamis. Subsea permafrost can be a hazard to coastal and offshore structures in the Beaufort Sea.

ANALYSIS

The Federal marine pollution program in Alaska is funded at a greater level than for any other region, exceeding $23 million in FY 1978. The program is almost entirely funded by BLM and managed by NOAA's Outer Continental Shelf Environmental Assessment Program (OCSEAP). Other Federal agencies in addition to BLM (EPA, USGS, USCG, and NOAA) contribute limited funds, as do the State of Alaska and private industry. Because of Alaska's harsh environment and vast distances, program support costs are large, accounting for nearly 40 percent of program expenditures.

Of the remaining $15 million effort, over 50 percent is devoted to studies of environmental characterization and biological effects. These types of studies, involving ecosystem characterization, food-web dynamics, concentration and effects of pollutants, and physical oceanography, while not unique to Alaska, are particularly applicable to poorly understood, pristine subarctic and arctic areas. The balance of the FY 1978 Federal program is devoted to environmental problems peculiar to the Alaska regime.

The current program addresses each cited need, with the exception of specific studies on the effects of sand and gravel removal in the Beaufort Sea. The efforts addressing the fifth and seventh need above are notably small. However, the contribution of State and private funds to these needs is unknown. The large effort directed at environmental characterization of the Alaska regime is subject to evaluation in terms of program priorities, especially in view of the 4- to 5-year effort already made in this area. Reports from geoenvironmental projects are incorporated in environmental impact statements and are used prior to leasing to evaluate the stability and safety of the lease tracts. None of the four wells drilled on the Alaska OCS (318,000 mi^2) has found commercial quantities of oil and gas.

h. Hawaii and Pacific Islands Region

The Pacific Islands Region includes the Hawaiian Islands and Pacific Trust territories (tropical oceanic islands of volcanic origin). Dominant environmental characteristics in the region are lack of a continental shelf, full exposure to oceanic conditions, and warm air and water temperatures. Coral reefs and beach and bluff configurations are typical.

Hawaii is a potential site for processing of deep seabed manganese nodules. Concerns related to this activity are environmental impacts of tailings and mineral processing effluents. Residual radioactivity at the Eniwetok Island weapons test site is a matter for concern, with particular emphasis on long-term fate and effects.

NEEDS

Seabed Mineral Extraction and Processing. Assess the impacts of pollutants associated with potential development of the deep sea-bed mineral extraction and processing industry.

Radionuclides in Areas of Former Weapons Testing. Assess the fate and effects of radionuclides in areas of former weapons testing.

Sedimentation from Land Development. Assess the environmental impacts of land development on sensitive coral environments.

ANALYSIS

The Federal program in Hawaii and the Pacific Islands was funded at $2.7 million for FY 1978. NSF funded studies of atmosphere-ocean transfers of metals and organic pollutants, with ancillary studies of circulation. DOE used $0.7M to fund studies at Bikini and Enewetok Atolls defining the levels and distribution of radionuclides in groundwaters, lagoon, surrounding ocean and sediment, as well as marine biota. DOE also supported a study of circulation and mixing in the Enewetok lagoon and contributed operating funds to the Mid Pacific Marine Laboratory at Enewetok.

EPA participated with the U.S. Air Force in incineration of military herbicides near Johnston Island in 1978. The Deep Ocean Mining Environmental Study (DOMES) conducted south of Hawaii by NOAA examined the physical and biological effects of seabed disturbance and particulate plumes generated by prototype mining activities (about $1 million).

A small NOAA-funded effort examined the role of pathogenic bacteria and viruses from sewage in degradation of water quality in Hawaiian waters.

The Federal program appears to address adequately the principal concerns in this region with two possible exceptions. If the level and economic climate for deep-ocean mining of manganese nodules improves substantially, consideration should be given to the impact of full-scale, multiyear mining on the marine environment in the mining area, and the nearshore impact on the Hawaiian Islands of a mineral processing industry and its effluents.

i. Great Lakes Region

The Great Lakes comprise almost 20 percent of the world's surface supply of freshwater. Until recently, this huge volume was viewed as a virtually inexhaustible supply for such uses as drinking water, recreation, shipping, industrial cooling and process water, power generation, and waste disposal. However, increasing populations and advancing technological development with accompanying intensification of water and land use in the Basin have caused an accelerating degradation of the Lakes.

A number of areas in the Great Lakes region have undergone severe deterioration in water quality. In certain areas large inputs of nutrients, especially phosphorus from municipal and industrial effluents, land runoff, and atmospheric fallout have led to accelerated eutrophication. This has been accompanied by extensive changes in biota including the types of fish present. Unfortunately, these shifts in fish species have been from the more desirable sport and commercial varieties toward less desirable types. Eutrophication has also led to anaerobic conditions at the bottom of central Lake Erie resulting in destruction of almost all bottom organisms over large areas. Decreases have also occurred in the abundance of desirable types of algae and increases in types that cause problems such as clogging of water intakes and tastes and odors in drinking water.

The Great Lakes have been and are receiving large inputs of toxic materials such as pesticides, industrial organics, and heavy metals. These have been implicated in decreases in the populations of a number of sensitive species (especially fish and fish-eating birds). Concentrations of these materials in fish also pose a threat to human health. In many areas the responsible health agencies have recommended that Great Lakes fish be eaten only in limited quantities and the interstate transport of certain kinds of fish for interstate sale has been completely forbidden.

Deterioration of Great Lakes water quality has also resulted from input of bacteria, viruses, and other pathogens from combined storm sewer overflows. Many beaches near populated areas have been closed periodically, because of potential health hazards.

A final problem in the Great Lakes has arisen, because of the addition and displacement of sediments. Dredging of polluted sediments both in the tributaries and the Lakes themselves has at times increased exposure of organisms to toxic materials. Unpolluted sediments from dredging, land runoff, and shore erosion can cause problems by reducing light transmission in the water column. Settling of disturbed sediments degrades the environment for bottom-dwelling organisms.

NEEDS

Fates and Effects of Pollutants From Diffuse Sources. Determine the fates and effects in the Great Lakes of the mix of pollutants from diffuse sources, with particular emphasis on transformation products, remobilization products, and synergistic effects. Surveillance of pollutant fates and effects on the entire ecosystem must be continued to determine potential hazards to human health and lacustrine biota, and to assist in the development and refinement of control strategies and environmental indicators.

Assessment of Multiple Pollutant Effects. Determine the present and past condition of Great Lakes ecosystems through assessment of habitats and organisms that are the most sensitive indicators of pollution to assess overall effects of multiple pollutant inputs.

Diagnostic Models of Pollutant Fates and Effects. Develop diagnostic models of the fates and effects of pollutants entering the Great Lakes. Available information on inputs and ecosystems must be integrated so that pathways and behavior of pollutants can be determined.

Impacts of Toxic Organic Materials. Determine the sources, fates, and effects of toxic organic materials in the Great Lakes ecosystem. Special emphasis is needed to determine the concentrations in sport and commercial fish and the potential effects of these concentrations on human health.

Dynamics and Effects of Heavy Metals. Determine the amounts of toxic heavy metals entering the Great Lakes and develop an understanding of the cycling, transformation, and role of these materials and the ecological effects of the concentrations observed.

Human Health Hazards Related to Recreation. Determine the concentrations of pathogens, especially bacteria and viruses, in the waters of the Great Lakes and the human health hazards they pose to the recreational users of these waters.

Environmental Monitoring. Monitor, on an annual basis, the status of pollution in the problem areas of the Great Lakes, the overall water quality conditions of the lakes, and the long-term trends in environmental quality and ecosystem health. This need is mandated by the Water Quality Agreement between the United States and Canada.

ANALYSIS

The Federal program in the Great Lakes was funded at somewhat over $11 million in FY 1978. About two-thirds of these funds were furnished by EPA with about one-half of this agency's total devoted to monitoring and the other half to research. Much of this work was in response to the Great Lakes Water Quality Agreement between Canada and the United States, a joint program between the two countries to aid in the effective management of the Great Lakes. EPA's program was concentrated on studying the sources, fates, and effects of toxic materials ($2 million), especially synthetic organics, and on understanding and controlling nutrient overenrichment ($1.2 million).

In addition, DOI/FWS supported research on the effects of pollution on living resources of the Great Lakes ($820,000). The NOAA Sea Grant Program supported research through various universities in the area at a level of $350,000. This research attempted to determine levels and fates of toxic chemicals (especially PCBs) in the ecosystem.

NOAA, through the Great Lakes Environmental Research Laboratories (GLERL), funded $2.5 million in pollution-related research on the Great Lakes. These studies were devoted to experimental and modeling studies on the cycling and impacts of nutrients and toxics, ecological effects of nutrient enrichment, and the role of water movement in transporting pollutants.

At present, there appears to be adequate support for pollutant monitoring in the Great Lakes. However, the recently signed revised Water Quality Agreement requires further monitoring efforts. Therefore, this aspect may require additional funding in the future. Substantial efforts have been and are being expended toward understanding and modeling nutrient overenrichment and measures to greatly curtail phosphorous additions are being implemented. However, this area, especially with regard to diffuse sources, needs continued support to determine the measures that should be taken to alleviate most efficiently and economically the remaining eutrophication problems. Substantial efforts are underway to study fates and effects of toxic substances in the Great Lakes ecosystem. These materials, especially synthetic organics, are so prevalent in the ecosystem that this type of research needs expansion. There are few efforts directed toward evaluating ecosystem status or the human health aspects of Great Lakes recreation. These areas also need additional support.

C. Causes of Marine Pollution

Many human activities on land and in the oceans cause pollutants to enter the marine environment. Public Law 95-273 defines this ocean pollution as any short- or long-term change in the marine environment.

The first 5-year Federal Plan focuses on human activities that cause negative changes. To that end, the following working definition of ocean pollution was adopted by the Interagency Committee:

> Ocean Pollution means the results of human activities that cause, directly or indirectly, deleterious effects on the condition of the ecosystem, hazards to human health, or reductions in socioeconomic or esthetic quality of the marine environment.

Land-based activities are by far the greatest contributor to ocean pollution. Runoff from agricultural areas and urban centers enters groundwater and rivers that eventually drain into the oceans. Unknown amounts of pollutants are transported through the air to enter the oceans via atmospheric fallout. Wetlands are modified by dredging and filling operations that alter wildlife habitats and fish breeding grounds. These terrestrial sources of pollution contribute much of the pollutant load to coastal waters, and they are difficult to control, because of their diffuse nature.

In addition, industrial and energy facilities are generally aggregated in coastal areas and along tributaries that drain into coastal areas. Marine transportation, waste disposal, and offshore minerals development activities also contribute to point sources of marine pollution.

This section of chapter III of the Federal Plan describes those activities that contribute to ocean pollution and identifies research, development, and monitoring needs associated with each. The level of Federal effort with respect to each need underway in Fiscal Year 1978 is given, along with an analysis of the adequacy of that effort in satisfying the need. The identification of human activities that cause ocean pollution is limited to activities that occur in the marine environment as defined in Public Law 95-273. That definition limits the scope of this inquiry to activities occurring in the oceans, coastal areas, wetlands, and estuaries. While the significance of upstream and terrestrial sources of ocean pollution is well recognized, full consideration of their impact is beyond the purview of this report. Thus much of the research and monitoring currently underway as part of the Federal effort to assess inland sources that contribute to ocean pollution is not reported here. Future Plans will have to consider all sources, including those arising within the U.S. continental land mass.

An additional limitation on the analysis presented here is the scope of research and development programs considered. Only programs that have a primary focus on ocean pollution problems are reported. Not included are industrial and regulatory efforts such as development of improved industrial waste treatment processes or assessment of stock levels for fisheries management programs, which may yield information useful to ocean pollution programs as a secondary benefit.

Within these constraints, about $107 million, or 65 percent, of the $165 million Federal effort underway in fiscal year 1978 was directed at research, development, and monitoring on causes of ocean pollution. For analysis purposes, that effort is further divided into work related to coastal land use practices, waste disposal, marine energy, marine mineral resources, marine transportation, and other sources of pollution. Figure 3 shows the relative level of effort devoted to each activity category in FY 1978.

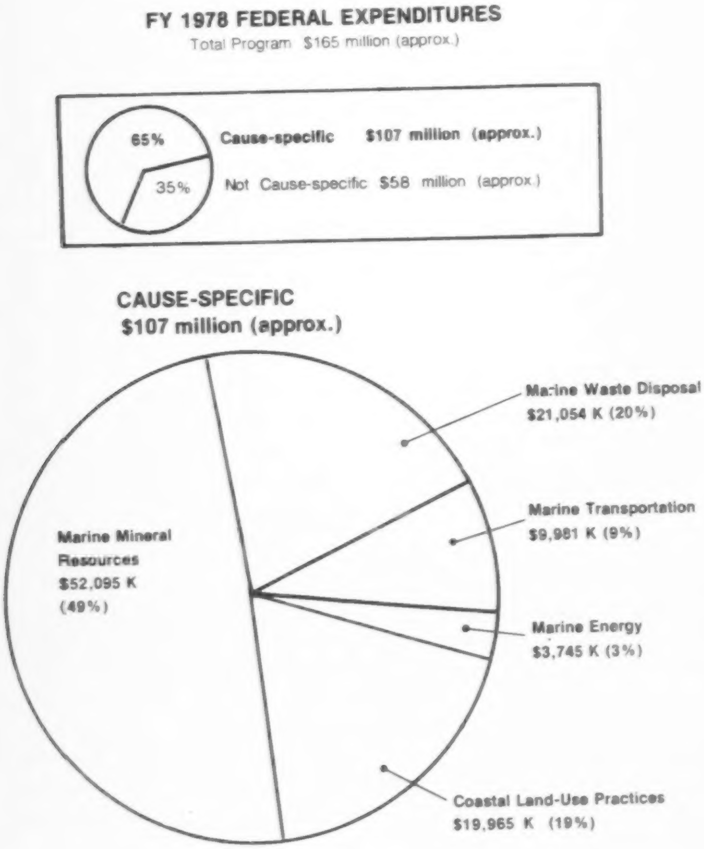


Figure 3 — FY 1978 Federal Program for Ocean Pollution Research, Development and Monitoring: Causes of Pollution

1. Land Use Practices

Coastal and upland areas are an important source of ocean pollution. The needs for ocean pollution research, development, and monitoring were assessed in relation to three factors that pose the most significant problems to marine areas: Physical alterations that result in habitat modification; nonpoint sources of pollution including upstream, terrestrial, and atmospheric contributions; and the siting of facilities for industrial and urban development in coastal areas.

Physical alteration of wetlands through dredging and filling, navigation channel development, and construction of jetties, breakwaters, and other coastal facilities can adversely affect water circulation patterns and living resource habitats. Physical alteration of the coastline by these activities may jeopardize the oceanic fishery resources of the ocean that depend on these areas for breeding and nursery grounds. These activities are often progressive and insidious, and the overall impact may not be recognized because individual projects are considered on a case-by-case basis. For example, less than 400,000 acres of California's original 3.5 million acres of wetlands remain today. At least 50 percent of Connecticut's tidal marshes have been destroyed, and the remaining 14,000 acres are being encroached upon at the rate of about 200 acres per year. Louisiana is losing 16 to 20 square miles of marsh annually as a result of erosion and lack of sediment replenishment.

For the purposes of the Federal Plan, nonpoint sources of pollution are defined as those sources that cannot be controlled at a single discharge point. This includes 1) urban runoff, which carries sediments, litter, animal droppings, atmospheric fallout from industrial stacks, and the residue of automotive transportation (lubricants, asbestos, and lead) into the ocean; 2) agricultural and forest runoff, which carries fertilizer residue, pesticides, sediment and animal wastes; and 3) the aggregate contribution from many upstream point sources resulting from river discharges to estuaries and the marine environment. It should be noted that the Great Lakes have been included in the definition of the marine environment for the purposes of the Act.

The threat of ocean pollution from industrial and urban development in the coastal zone often develops incrementally. One more house, factory, or store seldom is the key to total degradation of the marine environment. However, the aggregate of all these uses does significantly alter and degrade the environment.

Although some progress has been made, planning for coastal development is often done on a facility-by-facility basis with no consideration of the aggregate impact of multiple sources of ocean pollution in one area. Lack of a preplanned listing of acceptable sites for particular coastal facilities often hampers necessary development activities and results in prolonged litigation as the evaluation process mandated by the National Environmental Policy Act is carried out on a case-by-case basis. A similar lack of identification of particularly ecologically sensitive areas in the coastal zone often results in a poor initial choice of facility location. When this is discovered much later in the development process, great cost to both developer and the public at large result.

NEEDS

Effects of Coastal Zone Dredging. Determine the physical and biological effects of dredging and channelization in the coastal zone on a site specific basis.

Reduction of Aquatic Vegetation. Determine the effects of reductions in aquatic vegetation (marshes, swamps, mangrove forests, seagrasses, etc.) on productivity and survivability of marine living resources.

Regional Inventory of Upstream Sources of Pollution. Develop and maintain a regional inventory of upstream sources of ocean pollution, including resources and ecosystems at risk, municipal and industrial outfalls, agricultural and urban runoff, dredging and dredge spoil disposal, port operations, and recreation.

Estuarine Pollutant Levels. Determine existing levels of critical ocean pollutants in estuaries on a regional basis.

Models of Regional Coastal Flux. Develop general models for input and flux of pollutants through the narrow coastal region (wetlands and bays out to three miles offshore).

Models of Pollutant Fate and Effects. Information is needed on the link between environmental behavior of contaminants and their effects on marine ecosystems. The combination of the myriad of pollutants and the transformations they undergo must be understood. Descriptive models of this interplay of pollutants, the environment, and living organisms are needed.

Guidelines for Coastal Facility Site Selection. Develop the knowledge upon which to base use-specific guidelines for coastal facility site selection that take account of environmental, health, safety, and socioeconomic impacts.

Impact of Multiple Facilities. Develop methods for adequately assessing the overall impact of multiple facilities in a specific geographic region and make these assessments in selected areas.

ANALYSIS

Almost $20 million was spent in 1978 by EPA, NOAA, DOI, and the Army COE for studies of pollution problems related to coastal land practices. EPA spent the greatest portion of this, more than $15 million, for studies in Chesapeake Bay and the Great Lakes where programs are investigating the impact of land runoff in these confined water bodies. The Chesapeake

Bay program includes a major study of impacts on submerged aquatic vegetation. USGS carried out development of circulation and flow models for assessing the levels of pollutants entering various estuarine systems.

Several small projects totaling $84,000 focused on atmospheric inputs of pollutants. The remainder of the studies were carried out on a site-specific basis in areas such as San Francisco Bay ($400,000), Florida Coastal areas ($100,000), Barataria Basin ($120,000), the Great Lakes, and Chesapeake Bay.

FWS carries out a national pesticide monitoring program for fish and wildlife in coastal areas. FWS has also developed a regional classification scheme for coastal ecosystems.

Almost $1.4 million of the $20 million effort was directly related to studies of habitat modification. Most of these studies focused on evaluation of physical alterations and sediment movement in coastal areas. A small portion of the effort (less than 15%) addressed biological implications such as primary productivity, food web transfers, and relations between marsh vegetation and estuary health.

Land-use practices in the coastal zone probably have the greatest single influence on levels of pollutants entering the oceans. This aspect of the Federal program is underemphasized. While some work has taken place at regional levels, it is not coordinated for multipurpose application and little overall direction is provided at any level. A coordinated national effort should be undertaken to inventory sources of pollution entering the ocean through coastal areas and to develop models for pollutant influx. Efforts to develop guidelines for coastal facility site selection should be continued, and new methods for assessing overall regional impacts should be initiated. Assessment of the role of aquatic vegetation in local ecosystems should be continued as required in areas of special concern.

2. Marine Waste Disposal

a. Dumping of Sewage Sludge

National policy under the Marine Protection, Research, and Sanctuaries Act (Public Law 92-532) requires that all ocean dumping of sewage sludge be phased out by 1981. As of 1978, this requirement is well along toward implementation. Therefore, the research, development, and monitoring needs described below are restricted to existing ocean disposal sites used for sewage sludge, and are related to present and pending litigation. A relatively low level of funding is recommended to meet these needs. It is anticipated that they will be met during the initial 5-year planning period.

NEEDS

Pollution Identification. Complete the chemical identification of sludge pollutants at existing sludge dumpsites.

Movement and Alteration of Pollutants. Complete oceanographic studies of fractionation, dispersion and distribution of sludge pollutants within the water column and in bottom sediments.

Metals and Synthetic Organic Pollutants. Complete studies of bioaccumulation of heavy metals and synthetic organic pollutants attributable to sludge dumping.

Dumpsite Monitoring. Perform ecosystem recovery studies at representative phased-out dumpsites to determine time and degree of recovery, and abundance, distribution, and ecological effectss of residual pollutants.

Risk to Human Health. Perform a risk assessment of the human health consequences of sludge dumping at sea in terms that can be compared to similar risk analyses of land disposal practices.

ANALYSIS

In FY 1978, EPA spent $620,000 to survey the two remaining active sewage sludge dumpsites, one located in the New York Bight and the other off the coast of Delaware.

EPA Region II monitored the New York Bight site to determine possible degradation of the site from dumping practices. In addition, the quality of bathing water at New Jersey and Long Island beaches is studied every summer to determine their microbiological acceptability for water contact sports. EPA Region III makes quarterly oceanographic surveys of water and sediment quality at the Philadelphia sewage sludge dumpsite located approximately 50 miles off the Delaware Coast. In FY 1978, $150,000 of the total $620,000 funding was applied to developing the information necessary for writing Environmental Impact Statements for the two existing sludge dumpsites. Monitoring of active and phased-out dumpsites should continue, with emphasis on human health effects, to determine recovery rates and the ability of the oceans to absorb sewage sludge wastes.

b. Outfalls of Municipal Sewage

In addition to development of advanced technologies for sewage treatment and alternative disposal methods, the 1977 Federal Water Pollution Control Act Amendments require monitoring and evaluation of coastal municipal outfalls that are exempt from requirements of secondary sewage treatment. This monitoring is required for a 5-year period, which is the duraduration of each allowed exemption. In 1983, renewal of the exemptions will depend upon analyses of the monitoring data. For renewal, the analyses must demonstrate that the outfall in question produces no adverse impact on the balance of the ecological community surrounding it. In addition, the outfall must continue to meet other chemical effluent standards established by regulation. Research, development, and monitoring needs for municipal sewage outfalls, including those which discharge mixed domestic and industrial wastes, are as follows:

NEEDS

Movement and Alteration of Pollutants. Develop information on the biological, chemical, and physical processes that disperse, concentrate, and cycle municipal waste pollutants in the ocean. Knowledge of these processes is needed to evaluate and determine requirements for discharge permits under EPA's NPDES program. Facts concerning inshore biological, chemical, and physical processes can be used to improve the scope, accuracy, and precision of predictive evaluation of discharge permit applications. Predictive evaluations should include analyses of natural phenomena such as currents, winds, and wave conditions, especially storm events, that affect pollutant distributions as well as the effects of the important pollutants on ecosystems.

Synthetic Organic Pollutants. Determine the identity, source, distribution, persistence, bioaccumulation, and effects of synthetic hazardous chemicals in the marine environment, with special emphasis on food web transfers and health hazards to humans. Chlorination products from disinfection processes and antifouling compound residuals should be included in this investigation.

Outfall Monitoring. Determine the efficiency and value of differing sewage treatment practices in order to choose among them. Studies should also be made on the degree and rate of recovery of outfall-polluted environments after treatment is applied or discharges are removed.

Biostimulant Research. Evaluate the nutrient characteristics of particular inshore marine ecosystems, separating natural from manmade variations and accurately determining the degree and persistence of change that any proposed municipal discharge is likely to produce. This is necessary, because discharges from municipal sewage outfall contain large amounts of biostimulants that could overload the nutrient assimilation capacity of receiving waters. Evaluations should include ecological and economic effects as well as sources, dispersion, persistence, abatement technologies, and risk assessment protocols.

Sediments. Develop standard methods and criteria for determining the pollution content of sediments so that we can choose suitable treatment technologies and strategies. Knowledge is needed on potential bioaccumulation rates associated with the polluted sediments and the accompanying effects of these sediments upon diverse marine ecosystems such as coral, seagrass, kelp, and bottom invertebrate systems. Polluted sediments also affect migratory fishes and groundfishes in coastal waters, and these effects require ecological and economic evaluation.

Microbial and Biologically Active Pollutants. Determine the health and ecological risks caused by introduction of microorganisms and biologically active compounds from human and animal waste into the marine environment via municipal sewage outfalls. Areas of research, development, and monitoring that should be undertaken include sources, identification of dangerous species, persistence, transformation, measurement, diagnosis of health and ecological effects, development of risk protocols, and prevention of microbial contamination of the marine environment. Costs and benefits of abatement and prevention technologies should be determined.

Improvement of Municipal Waste Treatment Technology. Develop advanced alternative waste treatment technologies to reduce the volume and kinds of pollutants that reach the ocean. Although this very large area of waste treatment technology is beyond the scope of this document, its importance is recognized, particularly for geographic areas of immediate hazard such as the connecting channels of the Great Lakes and the broad continental shelf zones of the Atlantic and Gulf coasts. Technological, ecological, and economic costs and benefits of such technologies for a wide variety of wastes should be determined at the feasibility stage or before.

Monitoring Strategies. Develop new monitoring strategies to include consideration of the individual and cumulative effects of outfalls upon larger water masses and the ecosystems within them. Monitoring the effects of sewage outfalls in marine water traditionally has been a one-at-a-time effort on BOD, suspended solids and floatables.

ANALYSIS

In FY 1978, the Federal Program dealing specifically with municipal sewage outfalls totaled $2.9 million. Only research focusing on sewage has been included in this total. Projects dealing with specific pollutants are included elsewhere in this report. There are three comprehensive studies of the impact of sewage outfalls. These studies, all funded by EPA ($700,000 for FY 1978), deal with outfall problems in Hawaii, Southeast Florida, and Narragansett Bay, R.I. All three studies examine the effect of sewage stress on the respective ecosystems and the response of the system to removal of the stress.

In FY 1978, almost 35 percent of the total funds for studies of municipal sewage outfalls was used by DOE, NRC, and EPA for studies concerned with the effects of chlorinated sewage and powerplant cooling water on marine receiving waters.

Related to the problems of chlorination is research dealing with the identification, fate, monitoring, and effects of sewage-originated pathogenic microorganisms (principally bacteria and viruses). In FY 1978, almost 25 percent ($695,000) of the research program on sewage outfalls was devoted to research on marine microbial pollution.

One of the major scientific concerns is the impact of biostimulants (nutrients such as nitrogen, phosphorus, and vitamins) on the growth of phytoplankton and rooted aquatic vegetation. In addition to the three comprehensive studies mentioned above, the biostimulation problem is being addressed by EPA's Chesapeake Bay research program, NOAA's New York Bight study (MESA), and various studies in the Great Lakes.

It is recognized that there is a strong need for monitoring ecosystem response around ocean outfalls. The Clean Water Act provides for waivers of the secondary treatment requirement for municipal treatment plants provided that monitoring reveals no significant environmental degradation. While the FY 1978 program provides for very little monitoring of outfalls, present EPA/NOAA planning calls for each waiver applicant to conduct an extensive monitoring program. Additional monitoring, carried out by discharge permittees through EPA's NPDES program, has not been addressed in this report.

The main concern of the research on the technology of municipal waste treatment is developing the engineering (i.e., degree and kind of treatment) data for designing sewage treatment plants. This information is being developed through the ongoing ecological research and monitoring program. EPA's project in southeast Florida is examining marine ecosystem responses to different types of waste treatment.

The effects of specific pollutants present in sewage, such as persistent organic compounds and heavy metals, is covered in generic studies and comprehensive ecosystem studies underway in Chesapeake Bay and New York Bight. Likewise, sediment transport studies are underway in the two main study areas. The problem of sediment quality is being addressed in research by EPA, NOAA, and Army COE.

The current research program examining the effects of different kinds and degrees of treatment on receiving water biota is inadequate. Additional geographic areas should be studied.

The developing EPA/NOAA monitoring program should have built-in quality assurance so that the statistical significance of any measured environmental alteration from normal background can be determined. A data management system providing rapid and ready access to monitoring data should be developed for the national program on ocean outfall monitoring.

c. Disposal of Industrial Waste.

Industrial wastes differ among industries and among industrial processes for manufacturing the same materials. From time to time, even the composition of waste from the same outfall pipe differs. Such variations, coupled with ecological and hydrological differences in the sites, necessitate case-by-case consideration to administer the NPDES permit program for industrial wastes. For permitting purposes, guidelines for use within an industry or among industries using similar processes are useful, but cannot be counted upon if there is not a great deal of specific information on the kind, amount, transport, transformation, and effects of industrial waste in the ocean environment.

Land disposal of toxic chemical wastes is becoming less acceptable to the public, because previous disposal sites create severe, long-term pollution problems. Ocean incineration of such wastes has been shown to be a viable alternative. About 46,000 metric tons of toxic synthetic organics have been incinerated at sea in recent years.

The following needs relate to information identified as necessary for evaluating methods, costs, and benefits of industrial waste regulation.

NEEDS

Synthetic Organic Pollutants, Metals, and Inorganic Chemicals. Conduct research and monitoring to determine the sources, distribution, persistence, bioaccumulation, and effects of synthetic organics, metals, and inorganic chemicals in the marine environment, including food web transfers and health hazards to humans. Accidental chlorination products should also be included with materials deliberately discharged into saltwater environments.

Bioactive Industrial Compounds. Determine the ecological and economic effects of bioactive industrial wastes, in areas where they are significant, as well as the costs and benefits of existing and developmental abatement technologies. Certain industrial waste discharges are rich in compounds of carbon, nitrogen, and phosphorous, which act as nutrients in the marine environment, much as do domestic sewage wastes. Some wastes from pharmaceutical manufacturing and food processing also are high in nutrients derived from discarded living matter. Information derived from research and development activities on these wastes should be included in predictive risk assessment methods that are under concurrent development.

Monitoring of Industrially Polluted Environments. Make an ecological and economic analysis of the degree and speed of recovery of industrially polluted ocean environments. Persistent and nonpersistent synthetic materials should be considered separately.

Evaluation of Ocean Incineration Concept. Perform environmental and economic analyses of ocean incineration as an alternative to land-based disposal of hazardous materials. Consideration should be given to the air and water pollution consequences of incomplete combustion.

ANALYSIS

In FY 1978, $4.3 million was used to carry out research on industrial wastes, primarily at ocean disposal sites in the Gulf of Mexico and off the coasts of New Jersey and Puerto Rico. The Navy used $506,000 of this to monitor and develop treatment systems for ordnance-related wastes. EPA directed some work toward evaluating wastes from Caribbean rum distilleries and developing standard methods for biological testing of industrial wastes. A total of $2.2 million was used for research in other industrial dumpsite areas, primarily Deepwater Dumpsite 106, an industrial disposal site 90 miles east of Cape May, N.J. These studies focused on characterizing the chemical and biological nature of industrial wastes dumped at sea, physical characterization of the dumpsites, and laboratory studies of the effects of dumped wastes on several species of marine organisms.

EPA used $150,000 to monitor industrial dumpsites. USCG provided $250,000 for monitoring assistance, and NASA used $300,000 to develop remote-sensing capabilities for use in monitoring dumping activities. No programs were reported for monitoring industrial wastes discharged at ocean outfalls.

In 1978, MARAD completed a study on the economic and environmental viability of a ship to incinerate toxic chemicals. In addition, EPA is evaluating five proposed ocean incineration sites. This evaluation examines the environmental considerations necessary for writing an Environmental Impact Statement. About $300,000 was spent on this effort. EPA and USCG have a feasibility study underway to evaluate the utility of converting an existing offshore platform for ocean incineration.

Research and monitoring of industrial dumpsites should continue, to the extent they are useful for assessing the capability of the oceans to assimilate waste through ocean dumping. Overall emphasis should be shifted from ocean dumping to ocean outfalls and nonpoint sources. Ocean and estuarine areas impacted by industrial wastes should be monitored for degree and rate of recovery with respect to persistent pollutants on a site specific basis. Efforts in the ocean incineration area appear to be adequate.

d. Dumping of Dredged Material

Dredged materials by themselves are not necessarily pollutants. Their polluting qualities depend on how much they have been contaminated by other pollutants and where they are redeposited. Even unpolluted dredged material can pollute areas where marine species are affected adversely by siltation, such as coral communities and oyster beds. Relatively little and only recent attention has been given to alternative uses of dredged materials, such as wetlands restoration, construction of artificial islands, and use as paving and building materials. For commerce and national security, harbor dredging must continue; therefore, much technological development and research are required to prevent pollution from dredged materials and to use dredged materials beneficially.

NEED

Ecological Impact. Perform studies to describe the ecological impact of disposal of dredged materials in the coastal environment. However, synthesis of existing information should be completed and evaluated to determine requirements or necessity for direction of further studies.

ANALYSIS

Prior to 1978, the Corps of Engineers completed a 5-year, $32 million program dealing with the environmental aspects of dredging operations. This program included evaluation of the ecological impact of dumping in coastal areas.

In FY 1978, COE, EPA, and NOAA spent almost $1 million for follow-on studies of the behavior of heavy metals associated with dredged materials and sediment transport. These studies provide information for making recommendations on disposal site selection in specific regions. NOAA and USDA used a small amount ($145,000) to evaluate stabilization techniques for disposal sites for dredged material. This work should continue.

While studies directly related to metals should continue, some of this effort should be redirected toward direct biological assessment in areas most likely to be subjected to dredging. Effects of sediment deposition as well as chemical alteration should be considered. Selected comprehensive studies (in areas such as Chesapeake Bay) that examine dredge disposal areas before and after dumping should be carried out with emphasis on recovery rates.

NEED

Prevention Technology. Develop means to minimize sediment resuspension and siltation in the water column. Techniques employing dredging and dredged material should be developed to minimize resuspension of materials and to contain or isolate materials when necessary during these operations.

ANALYSIS

In FY 1978 more than $1.7 million (half of the total dredged materials program) was spent, primarily by the Army COE (with a small amount by Navy), for the development of new dredging equipment and techniques to minimize the need for dredging, as well as for studies to understand the mechanism of sediment transport. Development programs directed toward minimizing the effects of dredging were not included.

While development of techniques to minimize the need for dredging should continue, some of this effort should be directed toward development of dredging technology that minimizes the effects of dredging by reducing sediment resuspension. Techniques of containment and/or isolation should be developed for disposal of contaminated dredged materials. Criteria for use of such disposal procedures should also be developed.

NEED

Monitoring of Disposal Sites. Use data from monitoring programs to determine the ecological effects of dredged material disposal on both short- and long-term bases. Ocean dumping regulations require such monitoring of existing and new ocean disposal sites.

ANALYSIS

In FY 1978 the EPA, NOAA, and COE spent a total of $658,000 to study the effects of dredged material disposal. Sixty percent of this was used to evaluate bioassay techniques and develop procedures for measurment. EPA carried out its study in the Great Lakes. NOAA funded a small project in Newark Bay. COE monitored open-water disposal sites in Elliot Bay, Wash., and Ashtabula, Ohio, as well as artificial wetlands constructed from dredged materials.

These monitoring programs should be continued and expanded to increase emphasis on ocean dumpsites. A mechanism for information exchange and coordination among separate activities should be established in order to pool experience and results.

e. Disposal of Radioactive Waste

The United States has not disposed of low-level radioactive wastes at sea since 1970. Before that time, however, such wastes were dumped in the Pacific at two sites near the coast of California and in the Atlantic at two sites near the Delaware coast. These sites provide areas for studying the long-term ecological impact of low-level radionuclides.

International treaty and U.S. law currently ban at-sea disposal of high-level radioactive wastes by deep-ocean emplacement. However, this disposal option should be evaluated and compared with land disposal options for future use in any overall comparative study of methods for nuclear waste disposal.

NEED

Dumpsite Monitoring. Perform ecosystem recovery studies at phased-out dumpsites to determine time and degree of recovery and residual radionuclide abundance, distribution, and ecological effects.

ANALYSIS

In FY 1978, EPA and DOE spent $585,000 to study and monitor disposal areas for low-level radioactive waste. EPA used most of these funds to study the fate and behavior of waste containers at the four phased-out disposal sites near the United States, a program that will almost double in size by 1980. To gain an understanding of the behavior of radionuclides in seawater, DOE used a small amount ($40,000) to carry out a continuing program to study an active disposal site for low-level radioactive waste in the Irish Sea. Current programs appear to be meeting identified needs, and no changes are recommended at this time.

NEED

High-Level Radioactive Wastes. Continue evaluation of methods for emplacement and study of potential consequences of disposal of high-level radioactive waste in the oceans.

ANALYSIS

DOE is carrying out a continuing program to investigate the possibility of high level radioactive waste disposal in submarine geological formations of the deep oceans. This program, funded at $3 million in FY 1978, is expected to continue at the same level through 1980.

Because of the importance of disposal of high-level radioactive waste, this project should continue at present or higher levels if greater effort would result in more timely information. Efforts should also be expanded to additional deep seabed disposal techniques such as encapsulation.

3. Marine Energy

a. Steam Electric Powerplants

About two-thirds of U.S. operating nuclear and fossil-fueled electric generating plants are in the coastal zone. Numerous additional facilities for energy conversion and transmission are scheduled to be operational in the coastal zone by the end of the century. Offshore floating powerplants are in the advanced stages of development.

Nuclear and conventional powerplants require large volumes of cooling water or engineered auxiliary cooling methods. This cooling water demand may elevate receiving-water temperature and alter the structure of local biological communities. Such alterations may actually be beneficial or may result in increased productivity and survivability of less desirable species at the expense of more desirable ones. During the past decade a number of studies have been carried out on the temperature stresses related to powerplants, with little evidence of widespread damage to receivingwater ecosystems.

Regulatory concern has shifted from discharge temperature to the issue of adverse effects of intake entrainment on small organisms passing through the plant in cooling water. Size of the discharge-mixing zone is now of lesser concern than actual effects of effluents on the balance of species in surrounding ecological communities.

All discharges of powerplant cooling water have trace amounts of metals dissolved from heat exchanger surfaces as well as small amounts of chemicals and biocides used for water treatment and to maintain efficient plant operation. Nuclear powerplants may discharge trace amounts of radionuclides.

NEED

Ecological Impact of Cooling Systems. Evaluate the impact of chronic low-level thermal stress in combination with effluent chemical pollutants from coastal and offshore powerplants. An unresolved issue in several adjudication proceedings concerning steam electric plants has been the extent to which cooling water damage to young of commercially, recreationally, and ecologically important species affects the abundance and distribution of the adults.

ANALYSIS

In FY 1978 more than $2 million was spent by NRC, DOE, EPA, NOAA, and FWS on research related to assessing the impacts of cooling water discharge on marine ecosystems. About half of the $2 million was directed toward identification of chlorination products and their behavior; a small amount was used to study the direct effects of chlorination products on fish and plankton communities.

A total of $540,000 (27%) was used to study the effects of elevated temperatures on shallow-water organisms including fish, benthos, plankton, and fouling communities. The Davis Besse powerplant on Lake Erie received special attention; other studies were less site specific. Several studies considered synergistic effects of temperature and pollutants.

A total of $480,000 (24%) was used to determine the behavior and effects of copper and radionuclides that may be discharged from cooling water systems and to measure the distribution of radionuclides in sediments of the Columbia River outfall where upstream nuclear plants have caused concern in the past.

Future studies on powerplant and industrial effluents should be aimed at determining the synergistic effects of chlorination byproducts and elevated temperature. A great deal of current and past research has dealt with the behavior and effects of metals in the marine environment. An attempt should be made to use information from these studies rather than to initiate new research specifically applicable to cooling water effluents. The utility of monitoring cooling water discharges for pollutants (particularly metals) normally discharged at very low levels should be reevaluated.

NEED

Transport of Pollutants From Powerplants. Characterize the physical, chemical, and geological conditions that influence pollutant transport and behavior in the vicinity of coastal and offshore powerplants on a site-specific basis before powerplant siting.

ANALYSIS

In 1978, NRC and DOE spent $1.9 million on studies directly related to defining transport regimes and developing predictive models for pollutants discharged from powerplants. Most of this was aimed at nearshore areas subject to discharges from plants in the coastal region. DOE directed some effort toward studies of transport regimes on the continental shelf, presumably in anticipation of offshore facilities. Support of basic modelling technique development should continue. However, emphasis should be placed on development of generalized techniques that can be modified for specific site conditions.

NEED

Geological Hazards. Assess geological hazards near operating and proposed coastal nuclear powerplants to estimate the risk of large-scale release of radionuclides through seismic activity.

ANALYSIS

Although no programs in the inventory can be identified as directly responsive in this area, considerable information on regional geological hazards is available through USGS programs that are not directly marine-pollution related. Prior to approval, each site is studied by the applicant, and the NRC reviews and audits these site-specific studies. NRC frequently requests USGS to participate in the review process. Present activities in this area appear to be adequate.

NEED

Habitat Modification Resulting From Offshore Powerplant Construction. Evaluate alterations to sediment transport, current patterns, and ecosystem structure resulting from construction of offshore powerplants and accompanying systems of electrical power transmission with their associated electric fields.

ANALYSIS

No offshore powerplants exist today, nor is their construction likely within the next 5 years. Federal programs to assess potential impact of offshore powerplants have focused on preparation of the EISs for licensing the manufacture of floating nuclear powerplants. Areas where offshore powerplants are most likely to be built should be identified. Using existing NOAA and EPA programs where possible, DOE should coordinate appropriate studies to define potential impacts in these areas.

NEED

Entrainment and Impingement. Develop techniques to minimize damage to the young of commercially and ecologically important marine species passing through cooling water systems, when siting of a generating plant in spawning and nursery areas is inevitable for economic, jurisdictional and engineering reasons. Protection of shallow-water sites and shorelines is the greatest technological challenge. Technologies of offstream cooling and diffusion need to be made more efficient and less expensive to build and operate.

ANALYSIS

In 1978 NRC and FWS spent a total of $210,000 to determine the ecosystem impact of entrainment and impingement from powerplant cooling water systems. Half of this was directed specifically at the effects on striped bass and white perch in the Hudson River. The other half was used to obtain information on design criteria for minimizing impact and for predictive models for fish stock assessments.

Generalized research to provide predictive models and information upon which to base system design for minimum impacts should be continued. Studies with limited application should be reevaluated and phased out as soon as information is adequate to determine probable impact.

b. Ocean Thermal Energy Conversion (OTEC)

Marine thermal gradient systems such as OTEC will use the temperature difference between warm surface waters and cold deep ocean waters as a source of energy for electrical power generation. Small-scale pilot programs to assess OTEC feasibility are being conducted off the coast of Hawaii. Engineering designs for full-scale OTEC plants indicate that the primary source of pollution from them will be the large cooling water flow necessary, as much as 10 times that required for an equivalent capacity conventional powerplant. While pollutant concentration in OTEC plant discharges may be equivalent to those in conventional discharges (e.g., 0.1 parts per million of chlorine as a biocide), the increased flow volume may be an environmental problem. Large-scale upwelling of nutrient-rich, cold bottom waters may also alter significantly the marine environment. Such problems are not expected to be of concern for at least 10 years, because development of commercial-scale OTEC plants will take that long to complete.

NEEDS

Effects of Water Movement. Evaluate entrainment, impingement, entrapment, temperature and pressure effects, and nutrient enrichment of surface waters for significance and duration. OTEC systems will move 10 times more seawater per unit of electricity generated than conventional electrical generating systems. Cold, nutrient-rich waters from below the thermocline will be mixed with warm, plankton-rich waters above it. Effects of this water movement on animals deep in the water column (mostly fishes) and on surface-dwelling planktonic and larger species need to be examined.

Effects of OTEC Chemical Discharge. Assess risks of possible hazardous chemical releases, including gases released in open cycle OTEC systems and chemicals that may be produced when offshore chemical production plants are integreated with OTEC facilities. Normally produced scale from sea salt and accidental releases of ammonia, chlorine, hydrogen, and aluminum smelting residues also need to be evaluated as potential hazards.

Electrical Transmission Problems in the Ocean. Evaluate the pollution and ecological disruption potential of underwater or buried sea floor electric transmission devices and the hazards of accidently severed transmission cables. OTEC systems may require underwater transmission of electricity to onshore power grids.

ANALYSIS

In FY 1978, DOE spent $876,000 on OTEC-related research. Almost 90 percent of this was for preliminary and baseline studies, including satellite measurements, for OTEC siting and eventual evaluation of ecological significance. Ten percent was used to evaluate effects of chemical releases from OTEC plants and potential impact of impingement and entrainment losses. This work is planned to continue at significantly greater levels for the next few years. The Federal program does not currently address the environmental consequences of electrical power transmission in the ocean.

Baseline studies for potential OTEC facility siting should continue. whenever possible, however, they should be carried out in conjunction with similar studies required by other programs such as BLM oil and gas leasing and deep-seabed mining. Current OTEC pilot operations should be used to gather information on the effects of movements of large watermasses. As much as possible, the pilot facility should be used as a field station for necessary studies of ecological impact and assessment. Research should be carried out on the effects of the electrical field surrounding the cable and on environmental disruption caused by the cable, because it differs from ordinary underwater pipeline construction and disruption.

c. Developmental Ocean Energy Technologies

A number of alternative ocean energy conversion technologies are being evaluated. Most are at the conceptual stage. Kinetic energy systems which would harness the power of wind, waves, tides, and currents, are being considered. Cultivation of marine biomass (kelp) for use as a fuel source is being explored. Pilot-scale projects dealing with extraction of coastal geothermal energy are underway. Also proposed is the possibility of satellite power systems that would capture solar radiation in space and beam the energy to massive receiving antennae in the ocean. These systems will not be significant energy sources in the near term; however, evaluation of possible polluting consequences to the marine environment should be part of early development work to ensure informed decisions in the long term.

NEED

Pollution From Other Energy Sources. Evaluate the pollution potential of other energy sources such as coastal geothermal systems, biomass fueled systems, kinetic energy systems, and satellite-powered systems as part of the overall development process for these technologies.

ANALYSIS

The current Federal program does not directly address the environmental consequences of these experimental energy systems, although some results from OTEC research on the effects of artificial upwelling may apply to biomass-fueled systems. Studies to determine potential environmental problems should be carried out as an integral part of development programs for all new energy-generating systems so that problems can be defined and taken into consideration in feasibility and economic assessments.

4. Marine Mineral Resources

a. Development of Oil and Gas

It is increasingly difficult to extract oil from U.S. onshore reservoirs. This is also true of offshore oil in shallow waters of the Gulf of Mexico. More difficult offshore oil recovery in Alaska, the northeastern Atlantic, and California coastal areas is the focus of active industrial interest. Whereas Cook Inlet and southern California oil fields are proven, Atlantic oil formations are just opening up to exploration. The Canadians are developing a natural gas industry in the Great Lakes, and United States interest in similar activities is growing. In Alaska, New York, the Great Lakes, and the New England States, the balance between oil and gas supplies, fisheries, and coastal recreation is a matter of heated controversy and some litigation. If we are to preserve our renewable resources as we extract oil and gas from the outer continental shelf, research, development, and monitoring are needed to provide a better foundation for rational decisions on minimizing risks and protecting other resources.

NEED

Discharges From Drilling and Production Operations. Determine the physical transport processes and ecological effects of drilling muds and cuttings, particularly in sensitive marine areas such as coral reefs, fish and shellfish spawning and nursery areas, and bottom communities near drilling platforms. Normal operational discharges from offshore exploratory and production rigs consist largely of drilling muds, drill cuttings, and formation water containing suspended oil and brine. Drilling muds vary in chemical composition to fit differing needs of the drilling process. Their range of chemical components should be examined. Based on this information, protocols should be established for composition and disposal of discharges of concern. A variety of overboard discharge methods for operational drilling platform wastes should be investigated. Although discharges from production wells are sampled periodically to keep oil content below 50 parts per million, the effect of this chronic discharge on marine organisms is a source of concern.

ANALYSIS

In FY 1978, EPA spent $348,000 to study the effects of drilling muds and cuttings on marine organisms. Laboratory and field tests were carried out primarily on benthic food-web organisms and communities. In past years, industry has done considerable work in this area; however, there is little agreement on its adequacy.

Past studies of drilling mud should be thoroughly assessed. Any new studies should emphasize effects under realistic field conditions. Sensitive marine areas should be identified and tested before siting drilling platforms so that appropriate discharge requirements can be set. Alternative discharge methods should be evaluated in selected test areas so that reconditioning or removal of drilling muds can be recommended for sensitive areas if necessary. Results of other ecosystem studies on the effects of long-term (20-year), low-level exposure to oil should be evaluated for applicability to discharges from production platforms.

NEED

Geological Hazards. Determine the geological hazards that affect the siting of platforms and other offshore structures. Sediment instability and seismicity are especially important. Special problems associated with petroleum development in the Arctic, such as the effects of ice gouging and permafrost, require additional study.

ANALYSIS

In FY 1978, the Department of the Interior spent more than $5.9 million on geological studies related to OCS activities. BLM used $4.3 million for region-specific assessments of geological hazards and sediment mobility. Of the effort, 61 percent was directed at Atlantic coast lease areas, 20 percent at Alaska areas, 11 percent at Pacific coast areas, and the remaining 4 percent at Gulf of Mexico lease areas. USGS spent an additional $1.3 million for tract-specific presale identification of geologic hazards on a detailed grid survey over all tracts proposed for current lease sale. USGS spent $289,000, primarily for nonregion-specific studies to understand sediment movement as a means of predicting seafloor instability. In addition, USGS requires that lessees make site-specific surveys for geologic hazards before emplacement of platforms and other offshore structures. Emphasis should be placed on development of risk and damage assessment criteria related to geologic hazards.

NEEDS

Sublethal Effects of Oil. Perform laboratory studies to determine sublethal effects of low concentrations of oil on marine ecosystems and conduct field experiments as the opportunity arises. Highly productive shallow-water fisheries such as Georges Bank are particularly susceptible to damage from production platform effluents and spills. The effects of chronic low-level discharges of oil must be evaluated in order to predict impact on fisheries.

Effects of Spilled Oil. Determine the effects of spilled oil on marine ecosystems and the ability of ecosystems to recover after a spill.

Detection and Effects of Oil Spilled Under Ice. Develop an understanding of how to detect the presence of spilled oil under ice, how it disperses, how it accumulates in leads and brine ponds, and how it affects migrating marine mammals and birds. Arctic conditions foster special needs; the arctic is not well understood, and variations in structure and function need to be measured as baseline information.

ANALYSIS

In FY 1978 almost $ 25 million was spent to study fates, effects, and distributions of oil in the marine environment. BLM funded the greatest amount, almost $18.5 million. EPA spent almost $4 million, or 46 percent. NOAA, DOE, USCG, DOA, AND NIEHS carried out other smaller programs.

Almost $7 million was spent, primarily by EPA and BLM, to study the short-term effects of oil on fish, birds, marine mammals, and shellfish. NIEHS carried out studies at a more basic level on carcinogenic responses and effects on organism defense mechanisms. NOAA funded studies on the direct effects of oil on fish and shellfish.

A small amount, $696,000, was used to study the behavior of oil, particularly its association with bottom sediments, while $3.4 million was used to measure existing natural and human-induced distributions of oil and trace elements in Alaska and the Gulf of Mexico.

BLM spent $13 million for physical and chemical oceanographic studies related to all concerns including studies on transport processes and the behavior of ice and permafrost in Alaska. Almost one-third of this work was carried out in Alaska. BLM funded one project, at a level of $561,000, to study oil-spill recovery rates in the middle-Atlantic.

A large portion of the overall oil and gas effort is directed at Alaska. This emphasis should be reevaluated. Special attention is being given to study of arctic ice conditions and the present effort appears to be appropriate. Emphasis should be shifted from studies of short-term effects to studies on the long-term synergistic effects of oil and other pollutants in the marine ecosystem.

NEED

Biological Characterization for the OCS Leasing Process. Identify important living marine resources and their habitats in order to assess the impact of OCS oil and gas development, and develop appropriate protective measures.

ANALYSIS

In FY 1978 more than $6 million was used for ecosystem characterization of OCS lease areas, primarily off Alaska, the middle and north Atlantic coasts, and the Flower Garden Banks area of the Gulf of Mexico. DOI/FWS carried out many of these studies. EPA used $1.2 million to plan overall assessment studies and to evaluate the ecological consequences of ongoing offshore activity in the Buccaneer Oil Field in the Gulf of Mexico. Emphasis should be placed on identification of sensitive marine areas before leasing and on assessment of impact in existing high-production areas.

Transshipment of Oil and Gas. Evaluate disruption of biological habitats caused by pipeline construction and placement across beaches and wetlands. Existing pipelines should be monitored to determine actual impacts.

ANALYSIS

EPA spent $67,000 in FY 1978 on a study to consolidate and evaluate existing information on submarine pipelines and their environmental consequences. BLM plans a similar study in the Gulf of Mexico. Based on the results of the EPA study, additional consideration should be given to studies of pipeline construction taking advantage of existing pipeline monitoring in sensitive areas.

NEED

Development of Preventive and Safety Technology. Develop techniques and equipment, including unmanned remote controlled equipment, to improve nondestructive testing and inspection of platforms and pipelines. Offshore platforms are "point sources" of potential spills. They are subject to the harsh marine environment and must be routinely inspected for potential failures. In addition, equipment must also be developed to detect promptly smaller discharges from pipelines. There is a need to develop the capability for independent evaluation of drilling technology. There may be a special need in the arctic for ability to stop blowouts under ice. Rapid movement of the ice pack may necessitate capping blowouts under ice. Methodology for pollution control under ice should be developed. Risk assessment of the probability and severity of such occurrences should be developed.

ANALYSIS

USGS spent $751,000 to develop equipment and methods for preventing drilling accidents and inspecting offshore structures. About 30 percent of that was used to develop sensors for hydrocarbon leak detection, and blowout prevention systems for deepwater drilling. The remainder was used for inspection-related developments on offshore platforms, including methods to detect and predict structural failure, underwater inspection tools, and improved safety for launching and retrieving divers and submersibles in heavy seas. Greater emphasis is suggested for risk analysis and development of inspection and prevention systems for Arctic use.

NEED

Assessment of Oil Spill Damage. Develop methods to assess damages from oil spills. The 1978 Outer Continental Shelf Lands Act Amendments establish an oil-spill compensation fund, which authorizes reimbursement for losses to national resources. Questions that need to be answered in order to administer this fund are: what was damaged? how was it damaged? and how much was it damaged? We need to be able to convert losses of natural resources into equitable monetary values.

ANALYSIS

Except for a few BLM projects to evaluate cultural resources (sunken vessels of historic interest) in the Atlantic OCS areas ($400,000 in 1978), there was no Federal effort to relate natural resource losses to monetary values. Methods for evaluating losses of natural resources in terms of dollars should be developed for use in liability compensation for oil spills as well as for use in cost/benefit analysis where pollution risks exist.

b. Deep-Seabed Mining

Manganese nodules and crusts, the focus of the activity, are found throughout the world in fresh- and saltwater. Commercially useable deposits, however, are limited to the deep seabed in international waters, primarily at depths of 4,000 to 5,000 meters. Although commercial scale mining is not likely to take place before the mid-1980s, exploratory recovery and small-scale prototype mining are currently being carried out. The chronic environmental consequences of removing large quantities of nodules and associated sediments from the deep seabed must be better understood.

NEEDS

Effects on Surface and Water Column. Present experimental technology for nodule recovery raises large volumes of sea-floor sediment to the ocean surface along with recovered nodules. To determine the effect of this sediment on the ocean surface layers, the following needs should be addressed:

- o Characterize the particle size range of particulate discharges, their chemical composition, and their physical integrity.
- o Determine the distribution and fate of sediments discharged at the surface.
- o Examine the extent to which surface discharges stimulate or inhibit plankton populations and whether dissolved or particulate discharged material enters the marine food web.
- o Consider the necessity and practicality of discharge below the thermocline.

Bottom Effects. Deep-sea mining disrupts the surface of the sea floor, and it is not known to what degree this disruption affects deep-sea life. Further, the importance of deep-sea benthic fauna in the oceanic food web should be determined. The following research is recommended:

- o Inventory species disturbed by the dredge.
- o Describe effects of the mining process on deep-sea life (e.g., masceration, siltation of food organism habitats or food organisms, attraction and destruction, and avoidance).

Processing and Production. Nodule processing is likely to be carried out at land-based facilities in the near future; but shipboard processing may become feasible. The chemical and physical properties of processing wastes disposed of at sea should be determined, and the effects of alternative disposal and processing schemes should be evaluated.

ANALYSIS

In 1978, NOAA spent $990,000 for studies related to the environmental consequences of the first successful test of a demonstration-scale deep-seabed mining system. Studies in previous years concentrated on establishing baselines and defining natural systems in potential mining areas. Slightly more than half of the total funding was used to study surface and water-column effects and characteristics of the sediment plume generated by the mining test operation. The remainder went to investigating the impact of the mining dredge on benthic organisms and defining the magnitude of the benthic plume created during the test. This program is scheduled to be phased out by 1980, as data analysis and synthesis are completed.

Additional work should be done to define completely the overall environmental consequences of deep-seabed mining. However, further studies cannot be cost effectively carried out without prototype mining operations by the deep seabed mining industry. Since additional prototype mining is not planned for the near future, further environmental assessment work should be planned and phased in when prototype mining is resumed. This work should be continued for a sufficient time to define long-term impacts on the deep seabed.

Studies to define the chemical and physical properties of nodule processing wastes should be undertaken in cooperation with industry. To the extent that such wastes may be disposed of at sea, research leading to criteria for disposal methods should be undertaken.

c. Sand, Gravel, and Shell Mining

Mining of sand, gravel, and shell occurs primarily on the shallow continental shelf in areas filled with ecologically and economically important marine organisms. It is a use that competes with habitat stability, sport fishing, commercial fin- and shellfishing, navigation, and aesthetics in the coastal zone. Although it does not introduce foreign matter or chemicals into the sea, it does cause extreme disruption in local areas of the shallow seafloor.

NEEDS

Technology Development. Develop mining technology that is less disruptive to the water column and surrounding seafloor. Silt containment and pattern mining to match hydrologic features of the area should be considered.

Long-Term Ecological Effects. Determine the long-term effects, on benthic organisms as well as fisheries, of substrate alteration caused by fine sedimentary particles that result from mining operations and eventually blanket the seafloor over large areas. Determine how both fisheries and coastal erosion processes, are affected by excavations in the seafloor caused by the removal of sand and gravel.

Short-term Hazards. Determine short-term effects on the metabolism and survival of organisms confronted with high concentrations of suspended fine sediments near mining activities.

ANALYSIS

The FY 1978 Federal program has no projects directly related to the pollution consequences of mining of sand, gravel, and shell; however, a 3-year environmental study in the Virgin Islands began in 1979.

Research and technologies related to dredging operations should be assessed for their applicability to mining of sand, gravel, and shell, and transferred where possible. Additional research should be undertaken where necessary on a site-specific basis to resolve unanswered questions on local ecosystem impacts. Considerable progress in mining of sand, gravel, and shell has taken place in Japan. Its industries should be canvassed for technologies that may help the United States reduce environmental concerns.

d. Brine-Producing Activities

Natural and manmade brines are heavier than seawater and tend to creep along the bottom in streams until physical mixing disperses them. In the few places where this is a problem, effects can be locally devastating to exposed marine life. Current brine-producing activities are seawater desalinization and removing brine from underground or undersea salt domes that are to be used for oil storage.

NEED

Brine Disposal. Study the dispersion of brine and the effects of brine disposal on marine organisms and ecosystems in affected areas.

ANALYSIS

In FY 1978, DOE spent $2.5 million to study the effects of brine disposal from oil storage facilities in Gulf of Mexico salt domes. This effort is planned to expand considerably over the next fiscal year. Funding in this area appears to be more than adequate given the relative significance of this problem. Brine disposal activities appear to be overemphasized with respect to the overall Federal program for ocean pollution.

5. Marine Transportation

The primary source of ocean pollution from marine transportation results from vessels carrying cargoes of oil and hazardous chemicals. Most of this pollution comes from operational discharges. Efforts to reduce operational discharges escalated as a result of the President's 17 March 1977 message concerning reduction of oil pollution in the oceans. The President's initiatives resulted in international agreements under the aegis of the Inter-Governmental Maritime Consultative Organization (IMCO). Parallel regulatory actions were also undertaken within the United States. These actions are expected to reduce considerably the amount of oil introduced into the oceans as a result of operational practices.

Through IMCO many agreements were also reached that will reduce the potential for accidental discharge of polluting substances from vessels. Again, the United States has begun a wide range of regulatory actions to implement these agreements. These efforts call for improved navigation of vessels, installation of crude oil washing and inert gas systems, improved steering gear systems, strategically located segregated ballast and improvements in the training of shipboard personnel. USCG has a vigorous foreign vessel boarding program to detect and eliminate substandard vessels. These efforts will affect the amount of pollution entering the sea, but accidental discharges from vessels will continue. The achievement of a zero accident rate is unrealistic in a potentially hostile environment such as the sea. Nevertheless, additional improvements in the status quo are possible.

NEED

Assessment Risk. Develop better information on general traffic routes for hazardous chemicals, trends in quantities transported, and the hazards of chemical products.

ANALYSIS

USCG identifies cargoes of particular hazard and establishes specific requirements for their traffic control and transfer operations. Although this applies to a limited number of products, USCG Captains of the Port are aware of and regulate all hazardous cargo movements within their areas of responsibility. Data on product traffic and quantities are available from various sources, but are not in a useful form. Information on hazards posed by a wide range of chemicals is available in several data storage systems, including the USCG's "Chemical Hazards Response Information System" (CHRIS), EPA's "Oil and Hazardous Materials Technical Assistance Data System" (OHM-TADS), and the "Chemical Transportation Emergency Center (CHEMTREC), operated by the Manufacturing Chemists Association. A description of the hazards associated with new chemicals to be shipped in bulk on U.S. waters must be submitted to USCG before the cargo can be transported. The number of chemicals contained in each of the USCG's and EPA's systems approximates 1,000; however, the data points for the hazards of each are not complete. CHEMTREC possesses a more complete information file, but much of the data is maintained as proprietary.

Better information is needed on general traffic routes of hazardous chemicals and on trends in quantities shipped. Existing levels of effort to ascertain the hazards associated with transported cargoes should be maintained. The hazards of new chemicals and products should be evaluatead as called for in the Toxic Substances Control Act.

NEED

Redundant Equipment on Vessels. Conduct additional research on the relative reliability of various safety systems.

ANALYSIS

Considerable technical work and analysis has been performed to determine the extent to which placing redundant equipment on vessels will reduce the potential for pollution incidents. This topic was most recently addressed at the International Conference on Tanker Safety and Pollution Prevention, and is being reviewed within the USCG's Commercial Vessel Safety (CVS) program. Because there is disagreement on the extent to which redundant equipment should be required, despite recent IMCO efforts, further study is needed on the relative reliability of safety systems.

NEED

Vessel Design Research. Perform additional work to determine optimum location of strategically placed segregated ballast.

ANALYSIS

Work has been accomplished through IMCO, Society of Naval Architects and Marine Engineers, and Ships Structure Committee. An ongoing study is also using resources of the American Bureau of Shipping, MARAD, and USCG.

There is still disagreement on the most effective way to optimize the location of strategically placed ballast. Additional work in this area would help settle the controversy.

NEED

Emergency Cargo Transfer Systems. Determine the utility of requiring emergency cargo transfer systems on tank vessels.

ANALYSIS

This question has been investigated on several occasions within various forums, including IMCO. Efforts to date have indicated that the systems would be of limited value; however, there is still some disagreement over the usefulness of such a system. An additional study would help resolve the questions concerning the relative costs and benefits of installing and maintaining such systems on tankers.

NEED

Personnel Error. Undertake further analysis of past pollution incidents to determine how to avoid placing operating personnel in situations that lead to human error.

ANALYSIS

Efforts to date have been primarily directed at determining the training that an individual must have to function satisfactorily in a position, and the level of manning that is needed to run a ship safely. The latest work in this area was performed as a result of the Presidential Initiatives of 1977 To Reduce Oil Pollution of the Ocean. These efforts culminated in the 1978 Conference on Training and Certification, sponsored by IMCO. The Port and Tanker Safety Act of 1978 also addresses this subject in detail. The unique dangers associated with maneuvering longer and larger vessels have been recognized, and operational tests have been made to determine the maneuvering capabilities of these vessels. Simulators have been built that enable operators to experience the problems of vessel maneuvering in a safe environment. Recent studies indicate human error is a major factor in 80 to 85 percent of all pollution incidents. Efforts are ongoing to define what human error is avoidable by changing the work environment. The work is extremely complex and is only in the initial stage. Work to identify how to avoid placing the human in situations a high probability of human error should be the focal point for the immediate future.

NEED

Pollution Threat From Lightering. Evaluate the threat of pollution posed by lightering operations off U.S. coasts. The results will allow prudent drafting of regulations and will support their enforcement.

ANALYSIS

Related analyses have been performed in conjunction with development of Environmental Impact Statements for proposed deepwater ports. Data should be collected and analyzed to evaluate the pollution threat from these operations.

6. Other Sources Of Ocean Pollution

a. Recreation

Recreational activities are probably a relatively minor source of pollution. Marine waste disposal and operation of pleasure boats cause most forms of recreation-related pollution.

NEED

Litter Generated by Recreation. Determine the amounts and kinds of pollution resulting from marine recreation, their importance, and what, if anything, need be done. The 103,000 tons of litter per year estimated to be generated by marine recreation is miniscule compared with the solid waste problem of even a small municipality. We do not, however, know much about the effect of litter on living resources or the loss of aesthetic value caused by this waste in coastal waters.

Habitat Disruption. Perform objective assessments of the effect on the ecosystem of recreation and the extent of its damage, costs, and benefits. Such data are needed by managers of recreational resources at the State and Federal regulatory level. Recreational activities that disrupt habitats are a concern. The public has a great interest in the problem.

ANALYSIS

In FY 1978 there were no Federal programs reported in this area. Assessment of aesthetic and ecological damage caused by recreational use of coastal and underwater Federal lands should be carried out with the objective of establishing regulatory and public awareness programs. State and local governments should be encouraged to carry out similar programs for areas under their jurisdiction.

NEED

Marina Design. Develop criteria for marina design so that flushing characteristics can be maximized and alteration of circulation patterns in the local environment can be minimized.

ANALYSIS

In FY 1978, EPA funded one $12,000 study on design of small-boat basins. Marina design studies to improve design criteria for small-boat basins should be continued.

NEED

Marine Sanitation Devices for Recreational Craft. Perform studies to determine whether chlorinated wastes discharged from small craft are more or less harmful than untreated wastes and whether treated wastes can be pumped directly overboard into coastal and estuarine waters. Devices to hold and treat domestic wastes on small recreational boats must meet minimum regulatory requirements set by the Clean Water Act. The boating industry and boaters have questioned the need for these regulations.

ANALYSIS

In FY 1978 there were no Federal programs reported in this area. Studies should be carried out to determine the effects of chlorinated wastes from small craft on recreational waters, The objective is to determine when and where, if at all, wastes can be discharged directly into coastal and estuarine waters.

b. Use of Living Resources

Industries that farm or process living marine resources may pollute local coastal areas where circulation is limited.

NEED

Wastes From Fish and Shellfish Processing. Document the kinds of pollutant problems caused by processing wastes and evaluate their ecological significance. The extent to which these wastes are a function of location or treatment problems should be examined.

Hatchery and Aquaculture Wastes. Evaluate the polluting consequences of wastes from marine hatcheries and mariculture should be evaluated to determine what, if any, waste treatment is necessary.

Disease Transmission. Determine the potential risk of disease transmission via fishery processing wastes, which may serve as vehicles for transmission of human and fish pathogens.

ANALYSIS

In FY 1978, no Federal activities were reported that directly addressed the ocean pollution problems expressed above. Studies should be undertaken in cooperation with the fishing and mariculture industries to identify and quantify pollutants in wastes discharged from their operations on a site-specific basis.

Likely pollution consequences should be estimated using related studies in other fields. Regulations, if necessary, should be developed by using such information. Fishery processing wastes should be evaluated for their potential for transmitting human and fish diseases.

D. Tools for Evaluating Ocean Pollution

Previous sections of the Federal Plan have identified key pollutants and their effects and discussed how these pollutants enter the marine environment. Detailed, accurate information must be developed on the consequences of these pollutants in the marine environment at present and projected levels. An inadequate information base can result in overregulation as well as failure to identify potential hazards before problems become acute or the situation is irreversible.

This section discusses the elements necessary for development of a comprehensive program to provide useful information on the consequences of ocean pollution. Major program elements are research, monitoring, technology development, measurement technology, quality assurance, and data and information management. Each of these areas are discussed in detail. Current (FY 1978) Federal activities are described, and needs for better coordination and improved program management and structure are highlighted. Figure 4 shows the distribution of the Federal budget in FY 1978 among research, development, and monitoring activities.

1. Research

To understand ocean pollution problems requires the answers to many questions. Paramount among these is the question of the capacity of the world's oceans to assimilate natural and manmade inputs so that impact on beneficial ocean uses is negligible. All research questions are elements of this principal issue. To answer these questions about the assimilative capacity of the oceans, research must determine where pollutants come from and in what quantities they enter the oceans (sources), how pollutants are transported and transformed once they enter the oceans (fates), and most importantly, how they eventually affect humans, marine organisms, and ocean uses.

The Research and Development Subcommittee of the Interagency Committee addressed these questions in detail. The work of the Subcommittee highlights key research areas that should be addressed to expand our base of knowledge on the effects of marine pollution. Working Paper No. 5 is the Subcommittee's report; conclusions are summarized below.

FY 1978 FEDERAL EXPENDITURES
Total Program $164,736,900

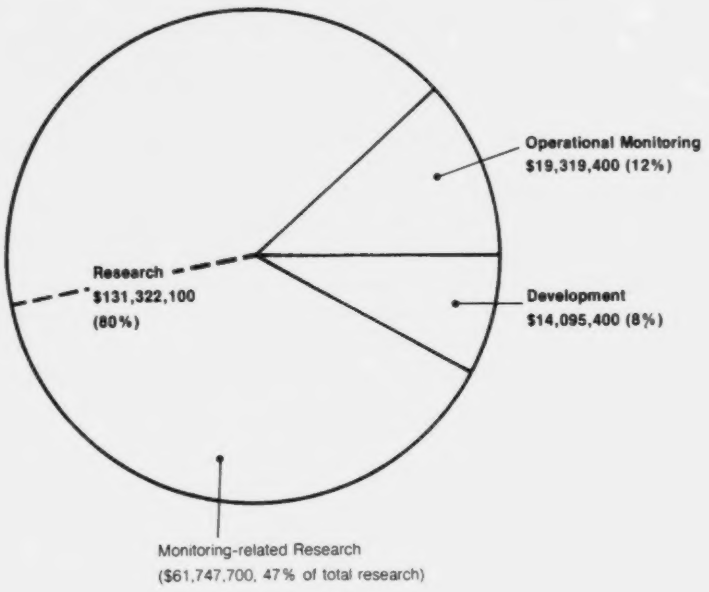


Figure 4 — FY 1978 Federal Program for Ocean Pollution Research, Development and Monitoring

Solutions to complex marine pollution problems can only be developed by addressing a carefully planned series of individual research programs. Incremental increases in knowledge and understanding build as the results of these research program become available. An overall understanding of the entire ocean pollution picture begins to emerge only after many specific problems and multidiscliplinary study areas have been explored and the results have been integrated in a comprehensive ecosystem approach.

Although scientists have been experimenting and examining the problem of ocean pollution for a number of years, the physics and chemistry of the world's oceans are still poorly understood. While increases in knowledge have been significant, new and more complex issues have been identified. Most theories about the transport and consequences of toxic elements in the marine environment are as yet unconfirmed. Our knowledge is incomplete on what happens to pollutants once they have been introduced into the oceans. R&D questions still exist on the extent to which pollutants change form, are absorbed by sediments, are accumulated or used by marine organisms, or are transmitted to the atmosphere. The role that natural processes such as river flow, winds, precipitation, and glacial movement play in the movement and transformation of pollution must be better understood.

Although the flux of materials into environmental reserviors as a result of human activities is only about 10 percent of that which occurs naturally, we know that a number of toxicants are present in the oceans principally, if not fully, because of human actions. Examples include PCBs, carbon dioxide from fossil fuel burning, and lead from automotive emissions. Research is required to understand better the dynamics by which these and other pollutant chemicals are transmitted to the oceans and their current and projected levels in the marine environment.

NEEDS

Initiate Long-Term Studies on Natural Ecosystems in areas unimpacted by human activities to provide an understanding of variability of natural ecosystems. The underlying concern in any pollution study is the ultimate impact and effect of pollutants. Effects on human health and the health of living resources as well as the economic and social consequences of pollution are the bottom line issues that must be addressed. Although studies have been underway for some time on the effects of pollutants on marine organisms, our knowledge in this area is grossly inadequate, particularly with respect to synergistic effects of multiple pollutants at the ecosystem level and the long-term sublethel consequences of pollution. Additionally, our information base is sorely lacking with respect to the natural variability of the marine environment. Without this information, it is not possible to determine the cause of significance of changes. Controlled experiments on entire ecosystems should be considered as a means to evaluate the complex effects of long-term chronic exposure to low levels of pollutant mixes.

Assess the Economic and Social Impacts of Pollution. This information is necessary for making the inevitable tradeoffs that will result from competing ocean uses.

Develop Predictive Models. The foremost objective in planning research and development efforts should be achieving a predictive capability with respect to levels, movement, transformation, and effects of pollutants entering the marine environment. Predictive models are necessary to assess the potential pollution impacts of marine and coastal activities and to plan for effective clean-up and control procedures. Such models depend on information on the introduction, transport, fates, and effects of pollutants in the oceans. Comprehensive models can be developed only after information on all these aspects has been made available.

Continue To Develop a Basic Understanding of Oceanic Processes. An underlying requirement for development of predictive models is the need for a basic understanding of oceanic processes. The speed and direction of water movement, chemical characteristics of foreign and natural materials in the marine environment, and air/sea transfer processes are representative of oceanic research areas having a direct bearing on predicting the consequences of pollutants in the marine environment. While it is recognized that such oceanographic studies are necessary to understand ocean pollution, oceanographic research areas such as fishery stock assessment and other nonpollutant-specific studies have not been included in this report unless they are undertaken as part of an ocean pollution program.

Perform Research Related Monitoring. It should be noted here that monitoring often plays an important role in research programs where there is a requirement to develop a data base over a sufficient length of time to allow for statistically meaningful analysis. Monitoring related to research is a most important aspect of pollution programs, particularly for establishing long term trends in the natural environment and for determining long term ecosystem effects of pollutants.

Identify New Ocean Pollutants. Our present knowledge concerning ocean pollution is valid only for those substances that have been identified as pollutants and studied relative to their behavior and effects when introduced into the ocean. Very little has been done to detect or predict what other substances may accumulate to unacceptable levels in our marine environment. We do not know what unknown future hazards may arise from our use of the oceans and their resources. Research programs to identify and deal with these new hazards before crisis situations arise represent the challenge in planning long-range R&D programs to combat ocean pollution.

Conduct International Programs. It is important to realize that pollution of the oceans is a global problem that requires the involvement and cooperation of many nations for its solution. Particular problems may require the participation of specific groups of countries that have common interests, e.g., nations that transport oil by sea or countries that dump industrial wastes into the sea. Although a single country may dispose of a small quantity of toxic substances, a group of countries may dispose of a significant total of pollutants.

Problems caused by toxic substances introduced into the ocean from several locales may not be immediately noticed, but after the passage of decades or more the cummulative effects may be enormous. This is particularly true for metals such as the transuranics, those elements heavier than uranium in the periodic table, and for some of the halogenated hydrocarbons. Nations must continue to work together at the regional level and must continue to expand cooperative multinational R&D efforts through organizations such as the United Nations Environmental Program (UNEP) and the Inter-Governmental Maritime Consultative Organization (IMCO). These international activities are the only means for effective global control of the introduction of pollutants into the marine environment and for mitigation of the effects of existing pollutants.

ANALYSIS

Federally funded ocean pollution research activities underway in fiscal year 1978 are described in chapters II and III of this document. Those chapters also analyze the adequacy of the efforts.

2. Monitoring

Marine pollution monitoring is one of the key sources of information about the health and safety of our coastal oceans and its resources.

The Monitoring Subcommittee of the Interagency Committee analyzed present Federal efforts on ocean pollution monitoring and developed the statement of monitoring needs, which is given below. Working Paper No. 2 describes in detail the work of the Subcommittee.

The basic overriding purpose for monitoring marine pollution is to obtain time-series data for detecting significant changes in parameters and to use this information to provide timely warning and other advice to management so appropriate actions may be taken.

For the purpose of this report, marine pollution monitoring is defined as systematic time-series observations of predetermined pollutants or pertinent components of the marine ecosystem over a length of time sufficient to determine the (1) existing level, (2) trend, and (3) natural variation of parameters of the water column, sediments, or biota.

Research and marine pollution monitoring are mutually supportive activities. Monitoring may be part of a research strategy. On the other hand, a prerequisite to an operational monitoring program is research to determine what components of a given ecosystem or what pollutants should be monitored, what should be the frequency of observations, how long and in what area a phenomenon should be observed and how the observations should be interpreted. Monitoring conducted as part of nonpollution-related programs may also benefit pollution programs.

NEEDS

Conduct monitoring of pollutant inputs such as operational discharges of industrial effluents and ocean dumping. The purposes of this activity are to set guidelines and standards, encourage and check compliance with regulations, and ensure that characteristics and effects of pollutant dispersion are within previously established limits.

Monitor the ecosystem (water body, sediments, and biota) to determine potential hazards to human health and marine biota, assist in developing or refining control strategies and environmental indicators, and advance research and technology for the protection of human health and the marine ecosystem.

Monitor food resources to determine their safety for human consumption. These activities are routinely performed to check whether viral or bacteriological microorganisms, toxic metals, or synthetic organics are present in seafood at known harvesting areas subject to effects of pollutants. The results are used to protect the public from eating contaminated seafood and to regulate fishing and shellfishing areas.

Conduct monitoring of spills, i.e, the level, fate, and dispersion of hazardous substances entering the ecosystem via accidents. Qualitative monitoring activities are usually short-term and are made to reduce ecological and human health impacts of discharges of hazardous chemicals. Continuing programs are carried out to determine long-term effects of spills as well as ecosystem recovery rates.

A program for measuring ocean inputs from rivers and aquifers. Although this monitoring effort is being conducted, a much expanded program would be required to provide a suitable basis for interpreting data that would be collected under the cited needs of effluent pollutant surveillance, ecosystem monitoring, and broad resource monitoring.

ANALYSIS

Needs for monitoring related studies span a broad spectrum and depend entirely on the nature of the research undertaken. The evaluation that follows addresses only operational monitoring.

About $18 million, or 11 percent of the Federal marine pollution research, development, and monitoring program was spent on operational monitoring in FY 1978. An additional $61 million was used for monitoring-related studies associated with research programs. Of these funds, $5.5 million was used for surveillance of pollutant inputs, $8.5 million for ecosystem monitoring, and $3.7 million for monitoring food resources.

Although no funds were specifically identified in the inventory for surveillance monitoring, these efforts are supported by the revolving fund established under the Federal Water Pollution Control Act.

Monitoring activities were distributed among the Federal Agencies in the following manner: EPA $7.4 million (42%), HEW $3.1 million (18%), DOI/BLM $2.7 million (15%), DOI/USGS $2.1 million (12%), NOAA $1.6 million (9%), and DOI/FWS $0.8 million (5%). In addition, EPA and USCG coordinate Federal efforts to remove and/or mitigate the effects of hazardous chemical spills in U.S. waters as provided for in the National Oil and Hazardous Substances Contingency Plan. A special fund was established by the Clean Water Act and has been available to support these activities for approximately ten years.

Table 1 summarizes monitoring programs carried out in fiscal year 1978.

A review of Federal monitoring activities indicates that, except for monitoring related to concerns for long-term trends in natural ecosystems and the chronic sublethal effects of pollution in the Nation's coastal waters, present monitoring efforts are responsive to the most critical needs. The combined efforts of private industry, local, State, and Federal governments assure for the most part that the general public is protected from the health hazards of contaminated seafood or exposure to polluted swimming areas. Surveillance of spills of oil and hazardous materials in coastal waters is handled through the National Oil and Hazardous Substances Contingency Plan. However, long-term monitoring is not underway to assess effects of chronic low levels of pollution, the effects of oil spills, and the natural variability in ecosystems.

Although there are programs for effluent monitoring, beach surveillance and shellfish monitoring, most of these efforts are underway in areas where the problems already have been identified and programs are oriented toward specific local concerns. Many areas of the country that are not close to major urban and industrial centers are not being actively monitored for pollutants. Monitoring in these areas usually ensues after a deleterious event or activity has been identified. This is a crisis-response philosophy. The approach should be one of prevention. A large part of prevention is, of course, source control; but a systematic regional monitoring program for coastal ecosystems would alert State and Federal agencies to potentially dangerous pollution situations before these actually occur. Systematic regional monitoring programs such as

Table 1.--Federal marine pollution monitoring programs - FY 1978

	Funding (Thousand dollars)
EPA:	
Great Lakes Programs	3,728
Chesapeake Programs	699
National Marine Pollution Monitoring Program (Mussel Watch)	0
Baseline Survey and Monitoring of Ocean Dumping Sites	1,500
NPDES Compliance Monitoring	411
State and Interstate Agency Water Monitoring (106)	550
National Water Quality Surveillance System (NWQSS)	550
Subtotal	7,438
HEW:	
National Shellfish Sanitation	2,300
Pesticides and Metals in Fish	800
Other	10
Subtotal	3,110
DOI/FWS:	
Natioanl Pesticide Monitoring Network for Birds - Waterfowl	120*
National Freshwater Fish Monitoring Network - Estuaries	100
Trans-Alaska Pipeline - Port Valdez	150
Great Lakes Surveillance	160
Sturgeon and Striped Bass in San Francisco Bay	250
Other	62
Subtotal	842
DOI/BLM:	
OCS Environmental Studies	2,689
DOI/USGS:	
National Stream Quality Network (NASQUAN)	2,100
DOC/NOAA:	
Ocean Dumping	400
Prince William Sound Hydrocarbon Monitoring	83
Chesapeake Bay	62
Northeast Coastal United States	437
Ocean Pulse	0
Microconstituents	616
Other	47
Subtotal	1,645
TOTAL	17,824

*Funded every three years

Mussel Watch have been conceived and demonstrated, but are not yet accepted or implemented on a permanent basis.

It is essential to have private industry, local, State, and Federal agencies involved in a cooperative program of marine pollution monitoring. Each has specific needs and concerns with varying perspectives. However, efforts are often made without knowledge of each other, and data and information are not readily exchanged between potentially interested managers.

It is clear that there is a need to establish an ocean pollution monitoring program to coordinate ocean pollution monitoring, collect pertinent monitoring information from all sources, assure that this information is converted into "management use" products, and develop regional programs of pollution monitoring programs appropriately interfaced with existing programs of freshwater monitoring.

Additional problems that limit the effectiveness of marine pollution monitoring programs are: a lack of proven technologies to carry out monitoring, particularly those that use indicator organisms; failure to use standard methods for sample collection and analysis of toxic materials in marine water and biota; lack of standard data recording formats needed to assure quality and comparability of data and to improve its usefulness to resource managers as well as its credibility in litigation proceedings; cost-effective monitoring programs. Nevertheless, many methodologies developed for continental monitoring programs have direct extension to ocean programs.

3. Technology Development

Research and monitoring programs provide the information necessary to understand and deal with complex ocean pollution problems. Development programs provide the technology required to support research and monitoring programs, control the amount of pollutants entering the marine environment, and alleviate the effects of pollutants once they have entered the oceans. In this section, development is defined as efforts to provide the technology needed to limit the introduction of pollutants into the marine environment; mitigate the effects of chronic and catastrophic introduction of pollutants into the marine environment; and provide the analytical methods, instrumentation, and equipment necessary for these activities and for research and monitoring of ocean pollution. Technology related to advanced waste treatment systems and alternative waste disposal schemes as well as prevention and safety related techniques are important elements of pollution control. These aspects have been only superficially addressed in this initial analysis and statement of needs, because their inclusion would have added a level of complexity beyond the scope of this first Plan. Measurement technology is an important development that applies to all elements of the ocean pollution program. The following section discusses it in greater detail.

NEEDS

Cleanup and Recovery Technology. Expand interagency eforts to develop effective cleanup technology for spilled hazardous materials. This initiative should include involvement of private industry to the maximum practicable extent.

Safety and Prevention Technology. Increase efforts at the Federal level to develop techniques for monitoring the environmental safety of offshore operations and storage and transfer facilities for oil and hazardous materials. While these efforts are not directly related to ocean pollution development, they yield results that can reduce significantly the likelihood of pollutants reaching the marine environment.

Measurement Technology. (See following section.)

ANALYSIS

In fiscal year 1978, eight Federal agencies spent $12.6 million or 8 percent of the Federal program for development to support programs of research and monitoring of ocean pollution and to prevent, reduce, and clean up accidental and operational discharges. More than three-quarters of that amount was spent by the USCG, EPA, and the Navy. DOI, NASA, NOAA, HEW, and USDA spent the rest.

The area of greatest emphasis was development of measurement systems to support research and monitoring, which received $7.5 million in Federal funds. This part of the Federal Program is discussed in more detail in the following section. About $2 million was spent on development of advanced waste treatment technology and $2.5 millions on development of technology for cleanup and recovery of oil and hazardous materials from accidental and operational spills. Technology development related to safety and inspection of potential sources of pollution received less than $0.5 million.

About $2 million of the development program was spent on waste treatment technology for the primary purpose of reducing ocean pollution. It must be emphasized however, that this represents a very small portion of the total effort on waste treatment development. As noted previously, most programs of waste treatment development are considered beyond the scope of this report and are not included. Only programs undertaken directly for prevention of ocean pollution have been considered. USCG, EPA, and Navy sponsored development of waste treatment systems and alternative disposal methods for vessel sewage, solid waste, and bilge water.

About $2 million was spent by USCG and EPA to develop technology for the cleanup and recovery of oil and hazardous materials. A total of $150,000 was directed toward chemicals and techniques for their use as dispersants, and $1 million was used to develop and evaluate cleanup equipment. Some specialized attention was given to cleanup in areas of fast moving currents and removal of oil from soils. An additional $1 million was used to develop recovery systems to ultimately dispose of oil and hazardous materials recovered during cleanup operations. A small amount, $200,000, was used to develop techniques for preventing discharges from disabled transport vessels.

Development of technology related to safety and inspection of potential sources of pollution accounted for about $0.5 million. While this does not reflect USCG's vessel inspection program, it does include development efforts directed at inspection and safety of offshore oil operations, coastal storage of oil and hazardous materials, and protection of shorelines from spills.

4. Measurement Technology

Measurement technology is an area of development that applies to almost all programs. For this reason it deserves special recognition. As noted in the previous section, it is frequently the limiting factor in developing information for ocean pollution problems. Essential prerequisites for carrying out research and monitoring are reliable measurement systems in the field and laboratory, accurate and repeatable testing techniques, and sample collection equipment that permits sampling consistency and does not alter or contaminate samples. State-of-the-art measurement of virtually all chemical and biological factors is limited to laboratory techniques as opposed to in-situ measurements. Although there are several freshwater, standards-setting organizations such as the American Society for Testing and Materials (ASTM), the American Public Health Association (APHA), and the USGS Office of Water Data Coordination, little attention has been given to marine waters and the specialized considerations necessary for their analysis. In general, methods are not standardized and few laboratories have the capability of performing analyses with acceptable accuracy and precision. Methods are labor intensive, expensive, and not easily automated or transferred to the field.

Development in the measurement area is frequently underemphasized in the competition for scarce dollars, partially because development often requires substantial lead time and thus cannot produce immediate results. As a result, research and monitoring are performed, but data may be questioned or worse yet, accepted as definitive, when in fact, measurement and sampling error may provide an inadequate information base for decision-making or comparison purposes.

Special emphasis should be given to development of measurement technology, which will benefit agencies involved in all areas of ocean pollution research and monitoring. Some interagency collaboration is already underway. Such efforts should be expanded.

NEEDS

Develop Standardized and Automated Laboratory Procedures. Standardized and automated laboratory techniques should be developed for the analysis of trace metals, toxic materials and nutrients in water, and samples of tissue and sediments. Such automation and standardization will reduce the number of highly skilled analysts required for routine, tedious, time-consuming tasks; increase the cost effectiveness of analytical work; and increase the capability to handle the large number of samples that will be required to carry out planned monitoring programs. A secondary benefit will be improved quality control permitting valid comparison of data from diverse laboratories.

Develop In-situ and Portable Systems. Reliable, accurate in-situ sensors and portable systems should be developed for measuring trace metals, toxic substances, and nutrients. Such systems are needed for situations such as unattended monitoring from buoys or structures, obtaining ground truth for remote measurement systems, monitoring compliance with pollutant discharge limits, and controlling pollutant levels in controlled ecosystem experiments. When expected pollutant and biological activity is patchy, the systems are needed to provide large quantities of data.

Automated Sampling Systems. A variety of standardized and automated sampling systems should be developed for collection of samples of uncontaminated water, sediments, and organisms.

Develop Improved Bioassay Techniques. Bioassay techniques and associated equipment should be developed for evaluating responses of benthic and free swimming organisms in both the laboratory and field to complex mixes of pollutants contained in water and in sediment. The feasibility of using biological organisms as indicators of pollution and as concentration mechanisms for low level pollutants in the marine environment should be explored.

Standardize Toxicity Testing. Standardized procedures and equipment should be developed to evaluate the sublethal effects of pollutants on organisms and their behavior.

Develop Strategies for Research and Monitoring. The relative roles of remote-sensing, in-situ, and laboratory measurements for use in ocean pollution research and monitoring should be assessed. The capabilities of each must be evaluated with respect to spatial coverage, accuracy, cost effectiveness and efficiency in overall measurement systems. Measurement strategies would include the use of cost-effective mixes of measurement techniques and platforms. Monitoring strategies should be chosen only after a thorough systems analysis of alternative approaches.

ANALYSIS

In fiscal year 1978 $7.5 million was spent for development of measurement systems to support programs of ocean pollution research and monitoring. More than half of this sum was used for development of remote measurement systems. USCG used the greatest part of this, $2.1 million, for surveillance equipment. Other agencies used $1 million for development of additional remote-sensing capabilities. Less than $700,000 was used for development of other types of sensors and detection systems. The other half of the measurement development program, $3.7 million, was used for development of chemical and biological methods and systems for measurement and testing related to ocean pollutants. A total of $1.8 million was spent on chemical methods for analysis of petroleum, pesticides, and water quality. An additional $1.8 million was spent on biological measurements. EPA funded almost all the biological programs, primarily for development of bioassay techniques and methods for detecting pollutants in organisms, use of organisms as indicators of pollution, and development of techniques and equipment for testing toxicity in ecosystems and organisms.

In addition FWS, USCG, and NOAA have funded related development as part of other research programs.

5. Quality Assurance

Quality assurance cuts across all aspects of Federal programs for ocean pollution research, development, and monitoring. It is a necessary element for accountability in regulatory and enforcement programs and could be a major means of achieving increased efficiency and cost reduction in research and monitoring programs.

For the information developed through the Federal Program to provide an adequate information base for policymaking or use of the Nation's oceans and to serve as a basis for regulatory and adjudicatory decisions, quality assurance is of paramount importance. Unfortunately, allocation of resources to quality assurance programs is usually done with great reluctance, and although many programs claim to have quality control elements, external signs of quality assurance are seldom visible.

Quality assurance involves ensuring maximum reliability in each measurement. Reliability is maintained through the use of standardized techniques, instrumentation, and methodology along with adequate auditing procedures throughout all stages of sampling, measurement, and recording in both field and laboratory. It is essential that information be reported on measurement uncertainty, including errors inherent in sampling, instrumentation, and analytical techniques, and that this information be retained with the original data to be made available to secondary users.

NEEDS

Develop Quality Assurance Tools. Quality assurance "tools" for use in marine quality assurance programs should be developed where they do not exist. "Tools" such as the following are needed: handbooks of standard methodology for sampling, analysis and reporting; standards (traceable to national and internationally accepted standards) for calibration of equipment and measurement systems; stable reference samples for intercalibration programs standard procedures for testing, evaluation, and calibration of field instrumentation; and standard performance requirements for instrument design.

Develop Standardized Procedures and Guidelines. Minimum guide lines should be established for performance standards in testing and analytical laboratories (quality control) to be met by all relevant federally funded relevant research and monitoring programs.

Develop Audit Programs. Auditing programs, including a continuing interfacility measurement comparison program, should be established.

Develop Certification Requirements. Requirements should be established for periodic certification of analytical laboratories should be established.

Establish Accreditation Procedures. A listing of accredited private, academic, and Federal facilities with capabilities for testing, calibration, and performance of ocean pollution research, development, and monitoring activities should be maintained.

ANALYSIS

A total of $856,000, or less than 1 percent of the fiscal year 1978 Federal program, was identified as relating directly to quality assurance, carried out by EPA, NOAA, and DOE. However EPA and USGS both have ongoing programs for laboratory quality assurance that bear on marine pollution programs. Both the Coast Guard and BLM plan to initiate small programs in fiscal year 1979. Furthermore, it is estimated that 15 to 20 percent of the Great Lakes National Program is spent on quality assurance on an annual basis. In FY 1978, 38 percent ($333,000) of the quality assurance program was spent on the development of reference samples and chemical method comparisons. An additional 27 percent ($235,000) was spent to develop tools and standards for instrument calibration and comparisons. Only $65,000 was directed toward calibration of operational field instrumentation. The remaining $227,000 in the program was used for interlaboratory comparison of bioassay procedures and toxicity testing.

The Taskforce on Data and Monitoring established by the President's Council on Environmental Quality (CEQ) has recognized the inadequacy of quality assurance programs on a national basis. The needs highlighted in this report are consistent with the conclusions of the CEQ team.

6. Data and Information Management and Dissemination

To assure that maximum benefit is derived from ocean pollution research, development, and monitoring activities, adequate consideration must be given to establishing a mechanism for interpretation and dissemination of the information obtained.

Recognizing this, the Interagency Committee established a Subbommittee on Data and Information Dissemination to examine the problem, review present Federal activities, and make recommendations for improvement. Working Paper No. 3 describes the work of the Subcommittee, which is summarized here.

Two very important concerns are that the information be available in a timely manner and in a useful form. It will be of little use to decision-makers if the necessary base of information lags years behind today's problems. Likewise, to be of maximum use, the information, when available, must be in a form that the user can easily understand. Because large amounts of data are likely to be collected, stored, and retrieved during monitoring operations, particular concern must be given to assuring that results are delivered to users in the shortest possible time.

Evaluation of needs for marine pollution-related information leads to two levels of requirements. The first level, management information, is required to assure that projects are properly run, goals and objectives are met, efforts are not duplicative, and results are available in the shortest possible time. This would normally require that the agency funding the project submit project information at the earliest possible stage in the planning process. If possible, the information should also be updated throughout the life of the project. Management information should be included on completed and ongoing work such as type of research activity, geographical area of investigation, funding agency, performing agency, principal investigator, and project goals.

The second level is data and information generated as a result of research and monitoring programs. Significant gains in the utility of Federal programs of ocean pollution research, development, and monitoring can be achieved through centralized storage of this type of information. The intent of this centralized accumulation of information is twofold. Initially, the usefulness will be primarily in making all results and findings available from one source. An additional benefit will be in using the information in the system to determine whether additional projects of research, development, and monitoring should be supported.

NEED

Establish a Network of Ocean Pollution Data and Information. A complete data and information network is needed to support programs of ocean pollution research, development, and monitoring. This network should be based, to the greatest extent possible, on the present information systems in Federal agencies. The primary purpose of a network of ocean pollution data and information would be to serve the needs of the public and decisionmakers as well as to respond to the needs of other users. The proposed network would have three elements:

- Subject Area Data/Information Centers--a series of centers where numeric and textual environmental data are available on specific areas, disciplines, or subjects.
- Central Coordination and Referral Office--a centralized office where inventories of environmental and management data and information on ocean pollution programs can be obtained.
- Depository--a facility that maintains, for referral, all hardcopy materials relevant to ocean pollution that are generated at Subject Area Centers and by investigators and the Central Coordination and Referral Office.

An effective network of data and information management will require a substantial commitment of money and personnel. Experience has shown that 3 to 4 percent of the amount spent on programs of research, development, and monitoring should be adequate for such a network.

ANALYSIS

Present data and information systems and programs can be classified according to the following categories:

- Hard data systems, which contain alphanumeric records of actual measurements and observations.
- Data referral systems, which index or inventory data collections and contain only descriptions of data files.
- Bibliographic information systems, which contain citations to books, journal articles, technical reports, and other publications.
- Document distribution systems, which disseminate copies of technical reports and other publications.
- Management information systems, which contain information on scientific projects such as project name, sponsoring organization, name of principal investigator, source of funding, and personnel.

All agencies of the Federal Government are responsible for dissemination of information relevant to their programs. Many of the Government's information systems, while large and comprehensive, do not support or relate directly to ocean pollution research, development and monitoring activities. Although most agency systems are single purpose, they do serve the overall needs of marine pollution activities in some respects. Agencies that have ocean pollution--related data and information systems include DOC, DOD, DOE, HEW, DOI, DOT, EPA, and USDA. A few examples of their systems are EPA's STORET, USGS's NAWDEX, and NOAA's ENDEX. In establishing a network for ocean pollution data and information, every effort should be made to build upon these existing systems, rather than to begin an entirely new system.

A problem that has limited the dissemination of marine pollution data has been the inherent multidisciplinary nature of this type of data. Traditionally, Government agencies have not distinguished between pollution data and information and that derived from other R&D programs. For example, the National Technical Information Service of the Department of Commerce is the central point in the United States for public sale of Government-funded research and development reports and other analyses prepared by Federal agencies, their contractors, or grantees. This collection exceeds 1 million titles; however, only a fraction of these are related to marine pollution. A similar situation exists with the Notice of Research Project File maintained by the Smithsonian Institution. This activity maintains a file of all current research activities whether or not they are pollution related.

E. Tools for Controlling and Minimizing Ocean Pollution

The consequences of marine pollution can be avoided by eliminating introduction of pollutants into the marine environment or by reducing the pollutants to levels that can be assimilated by the oceans without significant damage to marine ecosystems. In many cases, substantial reductions can be achieved through use of advanced waste treatment systems or adoption of appropriate precautionary and safety measures coupled with effective surveillance and enforcement. For sources such as agricultural and urban runoff, however, there is little likelihood of being able to reduce directly the amount of pollutants entering the oceans. Additionally, accidental discharges of pollutants will continue to despite efforts to avoid them. Effects of accidental discharges and spills can be minimized, however, by suitable contingency planning.

This section of the Federal Plan deals with research, development, and monitoring needs directed at efforts to control, clean up, and minimize the effects of pollutants in the marine environment. As noted earlier, however, most types of research and development related to waste treatment technologies are not included, nor are most safety, surveillance, and enforcement considerations, which are beyond the scope of this document. The Federal effort in this area amounted to approximately $12 million in fiscal year 1978.

1. Risk Analysis

Well-informed decisions on use, conservation, and development of ocean and coastal resources require a thorough assessment of the probability of pollutants entering the ocean from activities such as oil and gas development, industrial complexes, coastal powerplant siting, and transportation, as well as the value of natural resources that may be lost as a result of polluting incidents. Such information provides a basis for risk assessments from which comprehensive approaches for responding to polluting incidents can be developed in order to minimize damage to the environment. Risk assessments are also necessary for making informed, equitable decisions relating to competing ocean use activities and for assessing liability for damage to the environment from accidental spills.

NEED

Risk Analysis Techniques. Risk analysis techniques that include evaluation of social and economic factors and potential for human drror must be developed for use in decisionmaking relative to marine pollution.

ANALYSIS

Environmental Impact Statements are required for any Federal action that significantly affects the quality of the environment. The state of the art for evaluating risks involved in handling and transporting oil is good and has been evaluated in several study efforts. However, data on past hazardous chemical incidents are lacking. Risk assessment in this area is therefore weak. Little has been accomplished in comparing the social and economic ramifications of discharges with the consequences of limiting a particular activity that pollutes. This is primarily due to the lack of knowledge on pollutants other than the acute effects of pollutants. Studies are not routinely made on methods to reduce the potential for human error. Regulatory agencies usually make post-accident analyses of major polluting incidents, and the findings often result in new requirements to eliminate identified causes.

Levels of marine activity that might result in unacceptable levels of pollution should be defined. Current legislation should then be altered to require the submission of an environmental impact statement by all sponsors of activities that exceed identified levels.

NEED

Methods for Evaluation of Losses. Standard methods are needed for evaluating losses to natural resources from polluting incidents and for converting these losses to monetary values for liability determinations.

ANALYSIS

Work has been accomplished in this area in a number of forums. Assessment schemes exist in the States of Virginia, California, Washington, and

Florida. None of these methods is as extensive as is considered necessary for national standardization.

A review of existing and proposed schemes should be undertaken. The knowledge upon which to base a standard method for loss evaluation should be developed for use in administering the fund established by the Outer Continental Shelf Lands Act Amendments of 1978.

NEED

Spilled Pollutant Movement Models. Mathematical models have been developed to predict pathways that oil and/or hazardous chemicals can follow when released into the marine environment. Improved models that consider mixing and toxicity effects are needed for use in performing risk analyses and assisting personnel involved in planning cleanup and mitigation strategies during response actions, as well as for helping researchers in predict distributions of pollutants from waste disposal discharges.

ANALYSIS

A number of two-dimensional oil-spill trajectory models exist. Development of three-dimensional models is ongoing. USCG operates a Hazard Assessment Computer System (HACS) to describe the behavior of chemicals spilled on water and to calculate the hazards presented by these spills. Graphic output displays that show the relations between spill concentration, vapor dispersion, evaporation rate, venting and sinking, and flame size and location as a function of time have been developed for a variety of chemicals. This system permits locations, flame fronts, and explosive and toxic areas to be estimated. Vulnerability models are now being developed for use in predicting possible loss of life and property damage at specific geographical locations for various sized accidents. Tests to verify the HACS method are underway.

Development should continue on three-dimensional oil-slick trajectory models and vulnerability models. Testing efforts to verify the HACS model should be intensified so that improvements can be made. This latter effort should be given the highest of priorities, because of its potential for saving lives as well as limiting environmental damage. Better coordination in the development of oil spill trajectory models also appears to be needed.

2. Spill Cleanup and Response

Spills of oil and hazardous materials range from catastrophic releases to minor incidents. The capability to mount a rapid and effective response to polluting incidents is vital to minimizing their effects. Although the Federal government has expended much effort in this area, considerable work remains to be done, particularly in relation to spills of hazardous materials. Effective response equipment and techniques are required. Contingency plans must identify geographical areas by their susceptibility to pollutants if optimum strategies are to be arrived at during responses to pollution incidents.

NEED

Protection of Birds. Large oil spills often harm water-bird populations severely. Methods should be developed to keep birds from landing in waters affected by acute discharges of oil or hazardous materials.

ANALYSIS

Bird-repelling equipment exists in the form of noise-making devices. These are marginally successful and lose their effectiveness as birds become accustomed to the noise. Innovative ways should be developed to jeep birds from oiled areas.

NEED

Classification of Shoreline Vulnerability. Various shoreline types within a coastal zone are not equally vulnerable to spilled oil or hazardous chemicals. Coastal habitats need to be classified according to their vulnerability. This information can then be incorporated into contingency plans for responding to pollution incidents.

Present Activities.

Techniques for classifying shoreline areas with respect to ecological sensitivity have been proposed. Although a great deal of work has been done in the past, general agreement has not been reached as to the classification criteria. A comprehensive mapping of vulnerable areas has not been carried out.

Standard guidelines for classifying the vulnerability of coastal areas should be established. An effort should then be undertaken to catalog the classification of U.S. coastal regions.

NEED

Oil Spill Containment and Recovery Systems. Oil containment and recovery equipment that is deployable and functional in the highest sea states at which oil can be expected to exist in recoverable quantities is needed.

ANALYSIS

Devices exist that will function in 5-foot wind-driven seas. An ongoing program to improve operating procedures is expected to permit this equipment to be used safely in 7-foot seas. Refinements in operating procedures and existing systems are expected to permit oil to be recovered in up to 10-foot seas. Tests on the natural dispersion of oil slicks indicate that most oils will be driven into the water column when sea conditions exceed 10- to 12-foot wind-driven seas. A program to refine existing technology is therefore recommended. The current level of effort is considered appropriate.

NEED

Beach Protection. Spilled oil penetrates sand and harms burrowing invertebrates. Heavier oils tenaciously coat the rocks. In these situations, cleanup efforts can be as disruptive of ecosystem integrity as the spill itself. Shoreline damage from these causes could be lessened if nontoxic chemicals or substances could be sprayed on jeopardized beach areas to make sand less permeable and rocks less subject to oil coverage.

ANALYSIS

Efforts to date have included pretreatment of beaches with dispersants and surface collecting agents. Success has been marginal, and concern has been raised about the toxicity of the agents. Increased activity in this area is desirable.

NEED

Hazardous Chemical Spill Response Equipment. Better equipment and techniques to clean up hazardous chemical spills are needed.

ANALYSIS

EPA and USCG have an active program to determine methods to detect, identify, and mitigate the threat posed by spills of hazardous chemicals.

The problem is extremely complex. Although progress is being made much work remains to be accomplished. The current planned program is considered appropriate. Coordination between the principal Federal agencies is provided by the National Response Team.

NEED

Separating Oil From Water. Oil recovery devices recover a mixture of oil and water. A means to separate water from the recovered oil, possibly with a nontoxic chemical demulsifier, would greatly simplify the logistics and reduce the costs of oil recovery.

ANALYSIS

Efforts are underway to develop a mechanical oil-water separator for this purpose. Several commercial firms claim to have developed chemical demulsifiers. Operational tests of existing chemicals should be made along with toxicity tests of any successful demulsifiers. Future plans should be developed after the results of the above tests become available.

NEED

Measurement of Oil Slicks. Oil spilled on the ocean becomes a series of variable patches rather than a single concentrated mass. These patches differ in size and concentration. A means is needed to quantify the amount of oil in a given slick so that cleanup can be directed toward slicks posing the greatest threat to environmentally or economically sensitive areas.

ANALYSIS

Airborne electronic surveillance equipment has been developed to detect oil on the ocean surface under any weather conditions. The device, however, can only crudely estimate the amount of oil in a slick. State-of-the-art sensors from other applications should be tested in existing surveillance packages. Additional development should be undertaken only if these sensors fail to yield acceptable results.

NEED

Definition of Harm. For enforcement purposes harmful quantities of polluting substances must be defined. Simple measurement techniques must be developed. The existing definition of a harmful quantity of oil is a visible sheen. This definition meets the above criteria; however, controversy exists about its validity. Better scientific bases for defining harmful quantities of oil and hazardous substances are needed.

ANALYSIS

The quantity of oil that may be harmful in U.S. territorial waters and contiguous zone is defined as a visible sheen. No definition of a harmful quantity exists for waters beyond the contiguous zone. An EPA notice of proposed rulemaking has listed various hazardous substances and assigned to each a unit weight quantity that it considers harmful.

Research is needed to validate these criteria or to propose equally enforceable substitute definitions. This activity is crucial to the Federal enforcement program and should be given the highest priority.

NEED

Effects of Oil Dispersants. In carefully defined situations, EPA and USCG can authorize use of chemical dispersants to remove spilled oil from water surfaces. There is a continuing controversy concerning the possible effects of the use of dispersants on the environment. Research should be performed to resolve this matter and to develop effective chemical dispersants having reduced effects on health and the environment.

ANALYSIS

Limited joint industry-government (the American Petroleum Institute, EPA, and Coast Guard) programs are being conducted on open-ocean testing of dispersants. Results related to environmental concerns have been inconclusive to date. Tests to develop operational procedures have been performed and generally have been successful.

A joint industry-government effort should be initiated to define the questions that must be addressed to determine the possible side effects of dispersants. A program to obtain the necessary data should then be planned and implemented.

NEED

Scientific Response. Although undesirable, polluting incidents provide a unique opportunity to study the effects of a pollutant on the natural environment. If the capability to marshall a competent, effective scientific team exists, much useful information can be gained regarding pollutant behavior and effects. Such information is also valuable to future risk analysis. Participating scientists would also be available to support cleanup personnel on environmental matters. The capability to mount effective scientific response to polluting incidents should be developed and maintained.

ANALYSIS

The National Response Team mandated by the National Oil and Hazardous Substances Contingency Plan calls for NOAA and EPA to designate personnel as Scientific Support Coordinators (SSCs) in the coastal and inland regions of the 10 Federal regions. SSCs are responsible for coordinating post-spill damage assessments and research at spills of opportunity. They are also required to organize local scientists to provide scientific support to the Federal On-Scene Coordinators, the individuals responsible for ensuring that prompt actions are taken to remove and/or mitigate the effects of the spilled pollutants. To date several SSCs have been designated. The remaining SSCs should be designated and the local network of scientists should be established for each region of the country.

NEED

Detection of Hazardous Materials Dumping. In recent years a considerable amount of hazardous materials has been dumped illegally in coastal wetlands and other remote areas. Surveillance techniques should be developed to detect these activities and the locations of illegal dumpsites.

ANALYSIS

The Toxic Substances Control Act (TOSCA) and the Resource Conservation and Recovery Act (RCRA) form the framework for a mechanism for maintaining control over hazardous chemicals from cradle to the grave. To date no regulations have been issued to implement these acts. However, prototype in-situ sensors are being developed to detect certain classes of chemicals. Aerial photography has been successfully used to detect repositories for hazardous wastes. Some 300 chemicals have recently been designated as hazardous substances. The discharge of designated harmful quantities of these substances will violate the Federal Water Pollution Control Act (FWPCA) effective in June 1979. USCG and EPA will maintain a system of surveillance on land, water, and air to enforce these regulations.

The development of in-situ and remote sensors should be continued. They could be used to detect illegal discharges where discharges are frequent. Also recommended is continued and improved use of aerial surveillance to detect dumpsites.

NEED

Development of Spill-Response Capability for Ice-Infested Regions. Offshore oil development has begun in Alaska and is expected to increase substantially in the coming decade. There is also considerable oil transport through Alaska, Great Lakes, and Northeastern U.S. waters where ice is present. There is a need to develop procedures and equipment to detect, control, cleanup, and/or abate oil pollution in ice-infested waters.

ANALYSIS

USCG has made a comprehensive study of pollution response needs in ice-infested regions. They have performed initial investigations of oil detection and movement and modified some pollution-response equipment for arctic use. However, existing capability falls short of near-term needs. The USCG work is coordinated with the Canadian Department of the Environment's Arctic Marine Oil Pollution Program, which has similar goals. Develop procedures and equipment to detect, control, and clean up oil pollution in ice-infested waters of Alaska, the Great Lakes, and the Northeast.

CHAPTER IV: INITIAL PRIORITIES FOR MEETING NATIONAL NEEDS AND PROBLEMS

The previous chapters of the Federal Plan have identified pollutants of concern in the marine environment; described the effects of these pollutants on human health, living resources, recreation, and aesthetics; and discussed national needs in ocean pollution research, development, and monitoring. National needs were developed from two perspectives--needs associated with the various marine activities that cause pollution and those needs of greatest concern in the different regions of the country. Both analyses identify needs that relate to the distribution, transport, transformation, and effects of marine pollutants. A broader category of needs relates to the research, development, and monitoring required to supply information to reduce inputs of pollutants and limit damage from the pollutants that do find their way into the marine environment.

This chapter of the Federal Plan assigns initial priorities to the identified needs as called for in Section 4(b)(1) of Public Law 95-273. The assignment of priorities to national needs and problems in ocean pollution research, development, and monitoring actually began with the Estes Park Scientific Workshop and the Tysons Corner National Needs and Problems Workshop. At Estes Park, a group of recognized scientists reviewed the problem, identified key pollutants, and made recommendations on priority research needs. At Tysons Corner, key representatives of industry, public interest groups, State and local government planning agencies, and groups involved in adjudication of environmental issues reviewed the problem from the perspective of those involved in decisionmaking on coastal and marine activities. They identified significant national needs and problems as they relate to providing the necessary base of information to support rational, informed decisionmaking. By making this first identification of the scope of the problem, the workshops provided the base of important ocean pollution research, development, and monitoring needs and problems from which the priorities and recommendations in this document are derived. The proceedings of the workshops are set out in Working Papers 5 and 6. (See Appendix B).

A. Factors Considered in Establishing Priorities

All needs identified in this document are important to a complete understanding of the national ocean pollution problem. However, real-world fiscal constraints dictate assignment of priorities to the needs as a mechanism for efficient allocation of limited financial resources. This section establishes initial priorities on ocean pollution research, development, and monitoring needs related to marine activities at two levels. First, priorities are assigned to a set of broad categories based on ocean use activities. Second, priorities are assigned to specific research, development, and monitoring needs within each of these broad activity areas. This two-tier assignment of priorities provides a means for shaping broad program goals as well as for more detailed decisionmaking on specific research, development, and monitoring programs.

Members of the Subcommittee on National Needs and Problems of the Interagency Committee assigned priorities to the broad marine activity categories. Working Paper No. 4 gives the detailed work of the Subcommittee.

Section 4(b) (1) (B) of the Act requires that the value and cost of information which can be obtained from research development and monitoring work be considered in setting priorities. The value and cost of resulting information has been considered in a qualitative way in establishing priorities through use (with equal weighting) of the following factors:

- Immediacy of the pollution threat
- Value and importance of the polluting activity to society and the economy
- Intensity of the polluting activity
- Distribution of the activity, whether local, regional, or global
- Value of the resources at risk
- Likelihood of solving the problem in the near term, taking into consideration the availability of scientific expertise and cost-effectiveness.

Each Federal agency represented on the Subcommittee used these criteria to rank the marine activity areas in five levels. Based on the aggregate of these rankings and comments by Interagency Committee members, the needs for research, development, and monitoring were grouped into high-, medium-, and low-priority categories as shown below:

HIGH PRIORITY

Land-use practices
Outfalls of municipal sewage
Disposal of industrial waste
Disposal of radioactive waste
Steam electric powerplants
Oil and gas
Marine transportation
Disposal of dredged material
Control and mitigation of pollution

MEDIUM PRIORITY:

Deep-seabed mining
Mining of sand, gravel, and shell
Ocean thermal energy conversion (OTEC)
Brine-producing activities

LOW PRIORITY:

- Sewage sludge dumping
- Effects of recreation
- Use of living resources
- Developmental ocean energy technologies

No ordering of the activity categories within the high, medium, and low classification was attempted. The initial priorities are intended for use in shaping the overall scope of Federal programs. High priority areas should receive continued funding at present levels and should be prime candidates for increased funding when detailed program initiatives dealing with specific problem areas are developed. Medium-priority areas should be reviewed for program content, and any changes in individual project goals and funding that are identified as desirable should be accommodated within existing fiscal constraints. Low-priority areas should be carefully reviewed for program relevancy and contribution to a comprehensive national program, with future funding decisions guided by that review. Here it is important to note that there was a tendency to emphasize areas of immediate critical concern in applying the criteria to establish initial priorities. This approach is valid, considering the need to target financial resources and the pressing need to address the most critical effects of pollution on human health and living resources. However, research, development, and monitoring related to potential polluting consequences of future marine activities must not be eliminated in the press to respond to present crises. To do so would be to perpetuate the crisis response mode that drives much of the present Federal program. Therefore, in making funding decisions in the low-priority area, consideration must be given to the continuing need for forward-looking work directed at consequences of developing technologies and future marine activities. While such work may not warrant major funding at present, it must continue at an appropriate level to ensure timely availability of environmental information needed for future decisionmaking on marine activities. This is particularly true to work related to marine-based advanced energy technologies.

Drawing on the work of the Subcommittee on National Needs and Problems, the Interagency Taskforce, representing the Interagency Committee members, also assigned initial priorities to individual needs for research, development, and monitoring needs within each broad activity area. These priorities do not alter the overall priority framework established by the work of the Needs and Problems Subcommittee. Rather, they provide a means for focusing analysis on specific research, development, and monitoring work underway in each broad activity area. The prime consideration used by the Taskforce in assigning initial priorities to specific needs was the extent to which the need would contribute to a better understanding of the overall pollution impact of a given marine activity.

The Taskforce also examined marine pollution problems on a regional basis and assigned initial priorities to specific needs within marine regions of the United States. In the regional context, consideration was given to the present and projected level and mix of regional marine activities and present and potential impacts on human health and living resources of pollutants of concern in the region. The resulting priorities permit evaluation of the adequacy of current Federal efforts and formulation of recommendations for any necessary changes in program emphasis and direction.

B. Marine Activities Priorities

The major headings in this section reflect priority assignments made by the Needs and Problems Subcommittee. The parenthetical entries (a), (b), or (c) immediately preceding each need statement are the priorities assigned to individual needs by the Interagency Taskforce. Entry (a) is assigned to the most important needs, and (c) to those of least importance. It should be emphasized, however, that all needs identified in this document are significant and result from detailed Federal and non-Federal review of the ocean pollution problem. As noted earlier, Taskforce priorities do not alter the overall initial priority attached to a particular activity area.

HIGH PRIORITY

Land-use practices

(a) Inventory of upstream sources of ocean pollution. Develop and maintain a regional inventory of upstream sources of ocean pollution, including resources and ecosystems at risk. Sources such as municipal and industrial outfalls, agricultural and urban runoff, dredging and dredged material disposal operations, port operations, and recreation must be considered.

(a) Levels of estuarine pollutants. Determine existing levels of critical ocean pollutants in estuaries on a regional basis.

(a) Models of regional coastal pollutant flux. Develop general models for input and flux of pollutants through the narrow coastal region (wetlands and bays to 3 miles offshore).

(a) Guidelines for coastal facility site selection. Develop use-specific guidelines for coastal facility site selection that take into account environmental, safety, and socioeconomic impacts.

(a) Impact of multiple facilities. Develop methods for adequately assessing the overall impact of multiple facilities in specific geographic regions and carry out these assessments in selected areas.

(a) Effects of coastal zone dredging. Determine the physical and biological effects of dredging and channelization in the coastal zone on a site-specific basis.

(a) Reductions in aquatic vegetation. Determine the effects of reductions in aquatic vegetation (marshes, swamps, mangrove forests, seagrasses, etc.), on productivity and survivability of marine living resources.

Outfalls of municipal sewage

(a) Movement and alteration of pollutants. Determine the biological, chemical, and physical processes that disperse, concentrate, and cycle municipal waste pollutants in the ocean to improve the scope, accuracy, and precision of predictive evaluations of discharge permit applications.

(a) Synthetic organic pollutants. Identify sources, distribution, persistence, bioaccumulation, and effects of synthetic haz____________cals in the marine environment, with emphasis on food-web transfers and human health hazards.

(a) Outfall monitoring. Determine the degree and rate of recovery of outfall-polluted environments after sewage treatment is applied or discharges are stopped.

(a) Sediments. Develop standard methods and criteria for evaluating the pollution content of sediments so that suitable treatment technologies and strategies can be chosen.

(b) Biostimulant research. Evaluate nutrient characteristics of particular inshore marine ecosystems, separating natural from manmade variations and determine the degree and persistence of change that any proposed municipal discharge is likely to produce as a means of improving decisionmaking on alternative wastewater treatment and outfall sites. This is of highest priority in the Great Lakes area.

(a) Microbial and biologically active pollutants. Determine the risks of introducing microorganisms and biologically active compounds into the marine environment, including studies on sources, dangerous species and forms, persistence, transformation, measurement, diagnosis of health and ecological effects, development of risk protocols, prevention of microbial contamination, and cost/benefit analyses of technologies of abatement and prevention.

(a) Improvement of municipal waste treatment technology. Develop alternative waste treatment technologies, particularly for geographic areas of immediate hazard such as connecting channels of the Great Lakes and the broad continental shelf zone of the Atlantic and Gulf coasts, which are threatened by pollution. Technological, ecological, and economic costs and benefits of such technologies for a wide variety of wastes should be determined at the feasibility stage of development or before.

(a) Monitoring strategies. Develop new monitoring strategies, including biochemical and physiological techniques where appropriate, which include consideration of the individual and cumulative effects of outfalls upon large water masses and the ecosystems within them.

Disposal of industrial waste

(a) Synthetic organic pollutants, metals, and inorganic chemicals. Determine the sources, distribution, persistence, bioaccumulation, and effects of synthetic organic materials, metals, and inorganic chemicals in the marine environment, including food web transfers and possible human health hazards.

(a) Bioactive industrial compounds. Identify the ecological and economic effects of nutrient-rich industrial wastes in areas where they are significant and determine the costs and benefits of existing and developmental abatement technologies. Information derived in these research and development activities should be included in predictive risk assessment methods that are under concurrent development.

(a) Monitoring industrially polluted environments. Conduct ecological and economic analyses of the degree and speed of recovery of industrially polluted ocean environments.

(b) Evaluation of ocean incineration concept. Evaluate environmental and economic consequences of ocean incineration as an alternative to land-based disposal of hazardous materials.

Disposal of radioactive waste

(b) Dumpsite Monitoring. Perform studies of ecosystem impact at phased-out dumpsites to determine rate and degree of recovery. Also determine abundance and distribution of residual radionuclides and their cological effects.

(b) High-level radioactive wastes. Continue evaluation of methods for emplacement and for determination of potential consequences of disposal of high-level radioactive waste in the oceans.

Steam electric powerplants

(b) Geological hazards. Assess geological hazards in the vicinity of operating and proposed coastal nuclear powerplants to estimate the risk of large-scale radionuclide release as a result of seismic activity.

(b) Ecological impact of cooling systems. Evaluate to what extent damage to the young of important marine species affects the abundance and distribution of adults. The impact of low-level chronic thermal stress in combination with effluent chemical pollutants from coastal and offshore powerplants should also be evaluated.

(b) Transport of pollutants from powerplants. Characterize the physical, chemical, and geological conditions that influence pollutant transport and behavior in the vicinity of coastal and offshore powerplants on a site-specific basis before powerplant siting.

(c) Habitat modification resulting from offshore powerplant construction. Evaluate alterations to sediment transport, current patterns, and ecosystem structure resulting from construction of offshore powerplants.

(b) Entrainment and impingement. Investigate the ecosystem impacts of biological losses from entrainment and impingement of organisms in cooling-water systems.

Oil and gas

(a) Geological hazards. Determine the geological hazards that affect siting of platforms and other offshore structures paying special attention to sediment instabilities and seismicity. Special problems associated with development in the Arctic, such as the effects of ice gouging and permafrost, require additional concern.

(a) Sublethal effects of oil. Determine the sublethal effects of oil on marine ecosystems, especially under Arctic conditions. The effects of chronic low-level discharges of oil must be evaluated in order to predict impact on fisheries.

(a) Detection and effects of oil spilled under ice. Develop means to detect spilled oil under ice and its dispersion as it accumulates in leads and brine ponds. Determine its effects on migrating marine mammals and birds.

(a) Evaluation of drilling technology. Develop the capability to evaluate drilling technology independently.

(a) Blowouts under ice. Assess the probability, likely effects, and severity of blowouts under Arctic ice and develop methods to control pollution from such incidents.

(a) Assessment of oil spill damage. Develop methods to convert to equitable monetary values the losses of natural resources due to oil spills and methods to provide information needed for assessment of oil spill liability.

(b) Transshipment of oil and gas. Evaluate the impact on and disruption of biological communities caused by pipeline construction across beaches and wetlands.

(b) Development of preventive and safety technology for platforms and pipelines. Develop techniques and equipment, including unmanned remote controlled equipment, to improve nondestructive testing and inspection of platforms and pipelines and to promptly detect smaller discharges from pipelines.

(b) Discharges from drilling and production operations. Determine the physical transport and ecological effects of drilling muds and cuttings, particularly in sensitive marine areas such as coral reefs, fish and shellfish spawning and nursery areas, and bottom communities near drilling platforms. A variety of methods for overboard discharge of wastes from drilling platforms should be investigated, and protocols should be established for composition and disposal of discharges of concern based on this information.

(b) Biological characterization for the OCS leasing process. Identify important living marine resources and habitats that may be affected by development of OCS oil and gas so that appropriate protective measures can be developed.

(c) Effects of spilled oil. Determine the effects of spilled oil on marine ecosystems and their ability to recover after a spill.

Marine transportation

(a) Assessment of risk. Obtain better information on general traffic routes for hazardous chemicals, trends in quantities transported, and the hazards of new chemical products.

(a) Personnel error. Analyze past pollution incidents to determine ways to avoid placing operating personnel in situations that lead to human error.

(b) Redundant equipment on vessels. Carry out additional research on the relative reliability of various vessel safety systems.

(b) Vessel design research. Determine methods for optimizing the location of strategically placed segregated ballast.

(c) Emergency cargo transfer systems. Determine the utility of requiring emergency cargo transfer systems on tank vessels.

(b) Pollution threat from lightering. Evaluate the threat of pollution from lightering operations off the coast of the United States.

Disposal of dredged materials

(b) Prevention technology. Develop means for dredging and emplacement of dredged material that minimize resuspension of materials and contain or isolate materials during dumping.

(b) Ecological impact. Describe the ecological impact of dumping dredged materials in the coastal environment.

(c) Monitoring of disposal sites. Determine the ecological effects of dumping dredged material on a short- and long-term basis, using the data obtained from monitoring new and existing ocean disposal sites as mandated by ocean dumping regulations.

MEDIUM PRIORITY

Deep-seabed mining

(b) Characterization of discharges. Characterize the particle size range, chemical composition, and physical integrity of particulate discharges from deep-seabed mining.

(b) Fates and effects of surface discharges. Determine the distribution and fate of sediments discharged at the surface and examine the extent to which these discharges stimulate or inhibit growth of plankton. Determine whether dissolved and particulate discharged materials enter the marine food web. This information should be used to evaluate the necessity and practicality of requirements for discharging below the thermocline.

(b) Effects on deepsea life. Inventory the species disturbed by the mining dredge and describe the effects (such as masceration) of the mining process on deepsea life. Recolonization rates in disrupted areas should also be investigated.

(b) Processing and production. Determine the chemical and physical properties of wastes arising from shipboard processing of nodules and evaluate the effects of alternative schemes for disposal and processing.

Mining of sand, gravel, and shell

(c) Technology development. Develop mining technology that minimizes production of a fine sediment blanket around the mine site. Consider silt containment and pattern mining to match hydrologic features of the area.

(c) Long-term ecological effects. Determine the long-term effects on benthic organisms, as well as fisheries, of substrate alterations caused by fine sedimentary particles that eventually blanket the seafloor over large areas. Determine on a site-specific basis how excavations caused by removal of sand and gravel affect fisheries and coastal erosion.

(c) Short-term hazards. Determine the short-term effects on metabolism and survival of organisms confronted with high concentrations of suspended fine sediments in the vicinity of mining activities.

Ocean thermal energy conversion (OTEC)

(b) Effects of water movement. Evaluate how much the water movements associated with OTEC systems. affect deepwater animals (mostly fishes) and surface dwelling planktonic and larger species. Entrainment, impingement, entrapment, effects of temperature and pressure, and nutrient enrichment of surface waters require evaluation for their significance and duration.

(b) Effects of OTEC chemical discharge. Assess the risks of hazardous chemical releases associated with OTEC systems and chemicals that may be produced when offshore chemical production plants are integrated with OTEC facilities.

(c) Electrical Transmission Problems in the Ocean. Evaluate potential pollution and ecological impacts of underwater or buried seafloor transmission devices associated with OTEC systems and the hazards from accidentally severed transmission cables.

Brine-producing activities

(b) Brine disposal. Describe the dispersion of brine and assess the effects of its disposal on marine organisms and local ecosystems.

LOW PRIORITY

Sewage sludge dumping

(b) Pollution identification. Complete the chemical identification of sludge pollutants at existing sludge dumpsites.

(b) Movement and alteration of pollutants. Complete oceanographic studies of fractionization, dispersion, and distribution of sludge pollutants within the water column and bottom sediments.

(b) Metals and synthetic organic pollutants. Complete studies of bioaccumulation of heavy metals and synthetic organic pollutants attributable to sludge dumping.

(b) Dumpsite monitoring. Perform studies of ecosystem recovery at representative phased-out dumpsites to determine rate and degree of recovery and the effects of residual pollutant abundance, and distribution, and their impact on the environment.

(c) Risk to human health. Evaluate risks to human health resulting from sludge dumping at sea so that risk analyses can be compared for at-sea disposal and land disposal.

Effects of recreation

(c) Litter generated by recreation. Determine the amounts and types of pollution resulting from marine recreation, and what, if anything, need be done to reduce such pollution.

(c) Habitat disruption. Determine the impact of recreational activities that disrupt habitats. Develop objective assessments of effects on ecosystems, extent of damage, and cost and benefits for use by recreational resource managers at the State and Federal regulatory level.

(c) Marina design. Develop criteria for marina design to maximize flushing characteristics and minimize alteration of circulation patterns in local environments.

(c) Need for marine sanitation devices on recreational craft. Determine whether chlorinated domestic wastes from small recreational boats are more or less harmful that untreated wastes and whether wastes can be pumped directly overboard from small craft into coastal and estuarine waters.

Use of living resources

(c) Wastes from fish and shellfish processing. Document the pollutant problems caused by wastes from fish and shellfish processing and evaluate their ecological significance. The extent to which these wastes are problems due to location of facility or type of treatment should be examined.

(c) Wastes from hatcheries and aquaculture. Evaluate the pollution consequences of hatchery and aquaculture wastes so that the need for waste treatment can be determined.

(c) Disease transmission. Determine the liklihood that wastes from fish processing are vehicles for transmission of human and fish pathogens and evaluate the risk of such transmission.

Developmental ocean energy technologies

(c) Pollution from developmental energy sources. The pollution potential of developmental energy sources such as coastal geothermal systems, biomass-fueled systems, kinetic energy systems, and satellite-powered systems should be evaluated as part of the overall development process for these technologies.

C. Regional Priorities

The initial priorities given here -- high (a), medium (b), and low (c) -- were developed by the Interagency Taskforce. They are intended for use in formulating recommendations on necessary program emphasis and direction changes, if any, within each geographic region.

North Atlantic Region

(a) Oil and gas exploration on Georges Bank. Assess and monitor the probable effects on local ecosystems and highly productive fisheries of impending oil and gas exploration and development on Georges Bank.

(b) Assessment of spill vulnerability. Classify coastal areas according to their vulnerability to spills of oil and hazardous materials for use in formulating better contingency plans to protect high value recreational areas and rare and habitats of endangered species.

(b) Siting of powerplants and oil refineries. Use surveys, research on effects, and conceptual and numerical models to assess proposed coastal sitings for powerplants and oil refineries.

(a) Waste disposal. Assess the environmental impact of waste disposal near major coastal urban centers.

Middle Atlantic Region

(a) New York Bight area. Develop a comprehensive, coordinated scientific program to obtain environmental, economic, and social information on which to base future environmental, resource, and waste-management decisions in the New York Bight area.

(a) Assessment of Chesapeake Bay. Carry out a comprehensive assessment of the effects of agricultural and urban runoff, sedimentation, nutrients, and sewage on the biota of Chesapeake Bay, with emphasis on its aquatic vegetation. This work is needed to determine the long-term viability and sustenance of this system.

(b) Delaware Bay. Assess the environmental impacts of oil transport and refinery operations on the health of the Delaware Bay ecosystem.

(b) Industrial Dumpsite 106. Continue monitoring deepwater dumpsite 106 to assess local environmental impacts.

(a) Environmental monitoring. Develop a system for monitoring not only water quality but long-term fate and effects of pollution in this coastal region, particularly the New York Bight and Chesapeake Bay.

(b) Development of OCS oil and gas. Assess the impact of developing the outer continental shelf oil and gas through surveys, research, monitoring, and modeling of offshore and coastal ecosystems.

(b) Evaluation of past Long Island Sound studies. Evaluate past studies in Long Island Sound to determine long-term impacts (on the order of 50 years) of human activities on this body of water. Attention should be given to evaluating the extent to which sewage and other materials can be disposed of in open water and the consequences to living resources.

(a) Assessment of fish and shellfish stocks. Assess and monitor contamination in fish and shellfish harvested from the area, as well as from aquaculture projects, to protect the public from contaminated seafood.

South Atlantic Region

(a) Estuarine ecosystems. Develop an understanding of estuarine ecosystems, and their links with oceanic fishes, through a comprehensive research program that includes laboratory and field studies leading to development of models. Models should include determination of the extent to which habitats can be stressed before ecosystem balance is altered to the point of economic significance.

(b) Nonpoint sources of pollution. Carry out comprehensive studies to determine the fates and effects of nonpoint source pollutants from activities such as logging, urban development, and agriculture in selected estuarine systems such as those around Savannah, Ga., and Charleston, S.C., and within the barrier island system.

(b) Development of OCS oil and gas. Determine the potential impact of development of OCS oil and gas on areas such as the Blake Plateau. Particular attention should be given to the effects of OCS activities on estuarine-dependent fisheries, offshore shellfish beds, and reef areas.

(b) Oil spills and discharges off southern Florida. Carry out selected impact and recovery studies for potential oil spills and operational discharges on coral reefs, mangrove habitats, seagrass beds, and recreational resources off southern Florida.

(b) Sand dredging near St. Thomas, V.I. Assess the environmental implications of offshore dredging near St. Thomas and determine the effect this may have on nearshore biota.

(b) Impact of oil refineries on St. Croix. Assess possible effects that two major oil refineries on the island may have on sensitive reef systems.

(a) Coastal Land-use activities. Assess present and projected trends in coastal land use for recreation, agriculture, and industrial development.

(b) Thermal discharges in Florida. Evaluate the effects that cooling-water discharges from coastal industries and powerplants may have on ecosystem diversity and stability.

(a) Preservation of endangered species habitats. Perform a comprehensive study of the degree of habitat preservation (by such means as designation of refuge areas, and limited access areas) required for the propagation of endangered marine species, especially ocean turtles and manatees, two species particularly suffering from coastal development.

Gulf of Mexico Region

(a) Nonpoint-source pollutants from the Mississippi River. Determine the fates and effects of nonpoint-source pollutants carried by the Mississippi and other rivers into the Northern Gulf.

(b) Long-term effects of petroleum development. Determine the long-term (longer than 25 years) effects of petroleum development on living resources and offshore and nearshore environments so that historical ecological comparisons can be made.

(a) Assessment of North Central Gulf wetland and estuaries. Assess the effects of wetland and estuarine modifications along the North Central Gulf coast including the effects of channeling, dredging, filling, dredged material disposal, and oil and gas exploration. Determine the extent to which physical alterations can continue before productivity of the ecosystem is permanently lost.

(b) Petrochemical industrialization around Galveston Bay and the Texas Coast. Determine the long-term effects of increasing petrochemical and industrialization on Galveston Bay and the Texas coast for use in developing means to protect the aquatic environment and public health.

(a) Development in West Florida coastal embayments. Determine the long range effects of increasing coastal development on West Florida coastal embayments and offshore fishery habitats to determine the extent to which an area such as Tampa Bay can assimilate the impacts of urbanization and industrialization.

(b) Disposal of brine from salt dome storage sites. Monitor and study the dispersion of brine and its effects on marine biota as it is disposed from Strategic Petroleum Reserve storage sites in salt domes.

(b) Drilling mud discharges on the Flower Gardens Banks. Monitor and assess the effects of drilling mud discharges and other OCS-related activities in the Flower Garden Banks area.

(b) Effects of ocean outfalls. Investigate the ecological implications of waste disposal via point-source ocean outfalls in the Gulf.

Pacific Southwest Region

(b) Development of oil and gas. Assess the impacts development and transport of oil and gas in the area.

(b) Impacts of nonpoint-sources. Determine the effects of nonpoint-source pollutants on coastal ecosystems and evaluate the impact of contributions from agricultural chemicals, runoff, aerial fallout, and vessel wastes.

(a) Effects of ocean outfalls. Continue investigation of the ecological implications of waste disposal via ocean outfalls in Southern California.

(a) Impacts of geohazards on OCS petroleum development. Examine the potential impacts of geohazards on OCS petroleum development.

(a) Impacts of OCS petroleum development on critical habitats. Assess the potential impacts of OCS petroleum development on critical offshore habitats, particularly in the Channel Islands, Santa Barbara Channel, and Tanner/Cortes Bank areas.

(b) San Francisco Bay dredge and fill activities. Study historical, current, and planned dredge and fill activities in San Francisco Bay and describe the ecosystem impact of these alterations.

(c) Monitoring the Farallon Islands disposal sites for low-level radioactive wastes. Continue monitoring the low-level radioactive waste-disposal sites near the Farallon Islands to assess the dispersion, accumulation in biota, and possible transfer of these pollutants to humans.

Pacific Northwest Region

(a) Effects of complex pollutant mixes on sensitive habitats. Identify and assess the impact of complex mixes of pollutants on sensitive habitats of migratory marine species, especially birds, mammals, and anadromous fish.

(b) Effects of effluents on Puget Sound and San Francisco Bay. Identify and characterize the major marine components and processes which are involved in critical environmental problems related to industrial and municipal effluents in Puget Sound and San Francisco Bay.

(c) Petroleum development. Examine the potential impact of OCS petroleum development and transshipment on sensitive coastal habitats and identify potential geological hazards.

Alaska Region

(a) Ice damage in the Beaufort and Chukchi Seas. Assess the potential for damage to nearshore structures and pipelines from ice hazards, such as beach overriding and ocean floor gouging.

(b) Cleanup of oil spills in ice-covered regions. Develop the necessary technology to control and cleanup oil spills in ice-covered regions.

(b) Petroleum degradation by microorganisms. Determine the role of microorganisms in degradation of petroleum in Alaska coastal environments.

(b) Effects of petroleum development on Bowhead Whales. Evaluate the threat to bowhead whales from petroleum development with emphasis on their reproduction, migratory routes, and overwintering range.

(a) Effects of pollutants on sensitive habitats. Assess and predict the potential effects of pollutants on sensitive habitats such as the ice edge, which has been shown to be a biologically important area.

(c) Coastal industrial wastes. Determine the effects of pulp mill, fish processing, and other industrial waste effluents on water quality and ecosystems.

(b) Logging in Southeast Alaska. Determine the effects of clearcut logging practices on marine and anadromous fishery habitats and formulate effective methods for reducing impacts.

(a) Geological and physical hazards. Study the effects of geological and physical hazards on shipping, structures, and pipelines, particularly in the Cook Inlet, Prince William Sound, and Beaufort Sea areas.

Hawaii and Pacific Islands Region

(a) Extraction and Processing of Seabed Minerals. Assess the impacts of pollutants associated with potential development of deep-seabed mineral extraction and processing.

(c) Radionuclides in areas of former weapons testing. Assess the fate and effect of radionuclides in areas of former weapons testing.

(a) Sedimentation from land development. Assess the environmental implications of land development on sensitive coral environments.

Great Lakes Region

(a) Fates and effects of pollutants from diffuse sources. Determine the fates and effects of the pollutant inputs to the Great Lakes from diffuse sources with particular emphasis on transformation and remobilization products, and synergistic effects.

(a) Assessment of the effects of multiple pollutants. Monitor and analyze multiple pollutant inputs to the Great Lakes and evaluate the overall impact of these pollutants on Great Lakes ecosystems.

(a) Diagnostic models of pollutant fates and effects. Develop diagnostic models of the fates and effects of pollutants entering the Great Lakes.

(a) Impacts of toxic organic materials. Determine the sources, fates, and effects of toxic organic materials in Great Lakes ecosystems with special emphasis on concentrations in sport and commercial fish and potential hazards to human health.

(b) Dynamics and effects of heavy metals. Determine the amounts of toxic heavy metals entering the Great Lakes and their effects, with emphasis on cycling, transformation, and their role in Great Lakes ecosystems.

(b) Human health hazards related to recreation. Determine the concentrations of pathogens in the waters of the Great Lakes and the health hazards they pose to recreational activities.

(a) Environmental monitoring. Monitor, on an annual basis, the status of pollution in the problem areas of the Great Lakes.

D. Control and Mitigation Priorities

The overall category of research, development, and monitoring related to accidental discharge prevention and to cleanup and response to unavoidable discharges was assigned a high initial priority by the Interagency Committee. The Task Force then ranked the individual needs within the category as an aid to guiding Federal efforts. Coordination of Federal and non-Federal activities to meet these needs is the responsibility of the National Response Team formed under the mandate of the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500).

Accidental Discharges

(a) Risk analysis techniques. Develop risk analysis techniques that include social and economic factors and potential for human error for use in decision making relative to marine pollution.

(a) Methods for evaluation of losses. Establish, for use in liability determination, standard methods for evaluating losses to natural resource and other losses resulting from incidents of accidental discharge.

(a) Spilled pollutant movement models. Develop improved models that include mixing processes and toxicity effects for use in performing risk analyses and assisting personnel involved in planning cleanup and mitigation strategies during response actions.

Spill cleanup and response

(a) Protection of birds. Develop improved methods for preventing birds from landing in waters affected by acute discharges of oil or hazardous materials.

(a) Classification of Shoreline vulnerability. Classify coastal habitats according to their vulnerability and incorporate this information into contingency plans for responding to pollution incidents in selected critical areas.

(b) Oil spill containment and recovery systems. Develop oil containment and recovery systems that are deployable and will function in high sea states.

(b) Beach protection. Develop nontoxic chemicals that can be sprayed on beaches jeopardized by spills to protect them by making sand less permeable and rocks less prone to oil coating.

(a) Hazardous chemical spill response equipment. Develop better equipment and techniques to clean up and mitigate damage from hazardous chemical spills.

(b) Oil/water separator. Develop a ready means to separate oil from the oil/water mixture that is obtained during cleanup in order to reduce the logistic difficulties of such operations.

(b) Measurement of oil slicks. Develop a means to measure the amount of oil in a given slick so that cleanup operations may be directed at slicks posing the greatest threat to environmentally or economically sensitive areas.

(a) Definition of harm. Develop a definition for harmful quantities of oil or hazardous chemicals arising from spills and a simple means to measure these quantities for enforcement purposes.

(a) Effects of oil dispersants. Determine the environmental effects of chemical dispersants now used in certain situations to remove spilled oil from surfaces in coastal areas. Development of more effective chemical dispersants with reduced health and environmental side effects should also be undertaken.

(a) Scientific response. Develop and maintain the capability to mount effective scientific response to polluting incidents to take advantage of these incidents for gaining useful information on pollutant behavior and effects.

(b) Detection of dumping of hazardous materials. Develop surveillance techniques to permit detection of illegal dumping of hazardous material, particularly in unpopulated wetlands.

(b) Development of spill response capability for ice-infested regions. Develop procedures and equipment to detect, control cleanup, and/or abate oil pollution in ice-infested waters.

CHAPTER V: INITIAL RECOMMENDATIONS

Public Law 95-273 requires, in Section 4(b)(3), that the Federal Plan include recommendations for changes in the overall Federal effort in ocean pollution research, development, and monitoring as necessary to ensure that priority needs are adequately met during the Federal Plan period, fiscal years 1979-83. This chapter provides initial recommendations by drawing on the program analyses and priorities developed in previous chapters of the Federal Plan.

Two sets of recommendations are presented. The first set relates to specific areas of inadequate effort, as well as areas of possible overemphasis and duplication in the current Federal program. The second set concerns proposed technical and managerial actions that cut across scientific program areas and can lead to improved efficiency without regard to changes in program content. The tasks necessary to implement these recommendations are set out at the end of the chapter.

A. Programmatic Recommendations

Each of the needs discussed during development of this first Five-year Federal Plan has been assigned an initial priority in a previous chapter, based on the degree to which it would, if met during the Plan period, contribute to the national capability to understand marine pollution and make informed decisions on control and mitigation. The current Federal effort in FY 1978 is described in the catalog of Federal ocean pollution research, development, and monitoring programs (Working Paper No. 1) prepared as a source document for this Plan. For each need, the current Federal effort as defined in the catalog was evaluated by assessing how adequately the need was being met. The following criteria were used:

- o Need is clearly not being adequately met, or
- o Substantial work is being conducted, but adequacy of the effort is not clear, or
- o Need is clearly being adequately met.

The resulting evaluation of the adequacy of current Federal activities was then combined with the initial priorities assigned by the Needs and Problems Subcommittee and Task Force to identify areas where priority needs are not being adequately addressed and areas of possible program overemphasis or duplication. For example, ocean pollution research, development, and monitoring related to municipal sewage outfalls is assigned a high initial priority by the Needs and Problems Subcommittee. Within that activity area, the Interagency Taskforce assigned a high priority to work on pollutant movement and alteration and development of monitoring strategies. The present Federal effort in this area is less than 0.5 percent of the total ocean pollution research, development, and monitoring program.

municipal sewage outfalls are identified as an area where needs are not adequately met by the current Federal program.

The complete listing of areas where inadequate attention is currently being given by the Federal program to high-priority needs follows:

(1) On problems related to the effects of pollution on human health, there appears to be a need for:

- selected studies to determine the effects of microorganisms, synthetic organics, and biologically active transformation products.
- risk analyses to identify, evaluate, and rank potential hazards resulting from ocean pollution.

(2) On problems related to the effects of pollution on living resources, there appears to be a need for:

- identification of biological control factors that are particularly sensitive to pollution within the ecosystem
- use of impacted areas to identify effects of pollution by characterizing changes in natural areas and recovery rates of impacted areas
- identification of critical habitats of marine animals, sea birds, and marine endnagered species that are most vulnerable to pollution threats.

(3) On problems related to pollution impacts on recreational resources, there appears to be a need for:

- estimates of the potential value loss to marine recreation from marine pollution, particularly petroleum, synthetic organics, and pathogens.
- regional surveys of the availability of, and demand for, marine recreational resources including estimates of their value to society.

(4) On problems of coastal land use practices, there appears to be a need for:

- inventories of upstream sources of ocean pollution
- studies of estuarine pollution loads
- models of regional coastal pollutant flux

- information to formulate guidelines for selection of coastal facility sites
- studies to determine impact of multiple facilities

(5) On problems of municipal sewage outfalls, there appears to be a need for:

- data on pollutant movement and alteration
- monitoring strategies

(6) On problems of industrial waste disposal, there appears to be a need for:

- studies of synthetic organic pollutants, metals, and inorganic chemicals
- monitoring of industrially polluted environments

(7) On problems related to oil and gas, there appears to be a need for:

- studies of long-term, low-level effects of chronic discharges from multiple sources
- assessments of damage from oil spills

(8) On problems related to spill cleanup and response, there appears to be a need for:

- better definition of "harm"
- classification of shoreline vulnerability

(9) In certain geographic regions, there appears to be a need for:

- Environmental monitoring
- Studies of nonpoint-source pollutants
- Studies of point-source ocean outfalls
- Studies of the effects of multiple-source pollutants on sensitive habitats
- Studies of the fates and effects of pollution from diffuse sources, including sources, fates, and effects of toxic organic materials, with special emphasis on concentrations in sport and commercial fish and potential hazards to human health

In addition to areas of underemphasis, areas of potential overlap or duplication were identified. These areas, where a number of agencies have programs underway, should be examined in further detail to assure close coordination. Coordination will minimize overlap and duplication and permit adjustment of priorities where activity levels may be inappropriately high. However, each area should be closely examined before funding action is taken so that low priority needs continue to be met if they are necessary for future decisions on marine development and regulation.

Although some interagency cooperative programs are already underway, the following areas of multiagency programs should be reviewed in further detail to determine the need for improved coordination and efficiency:

(10) Studies related to petroleum and petroleum products

(11) Studies to define environmental baselines and existing pollutant distributions

(12) Studies on fates and effects of hazardous materials, particularly persistent synthetic organics

(13) Studies to develop transport models including airborne transport of pollutants into the marine environment

(14) Efforts to develop and apply marine bioassay and microcosm methodologies

(15) Efforts to develop standard methodology for marine monitoring and data management

Areas of potential overemphasis are those where significant Federal effort is currently underway and the Interagency Task Force assigned a medium or low initial priority to the addressed need. In some cases this assessment is based on a consensus that although questions remain, the point of diminishing return has been reached with respect to investigation in the area. The level of effort in these areas should be carefully tailored to properly meet individual agency missions without diverting available funds from other more pressing National problems. The Interagency Committee has not reached general agreement on this list. Areas of potential overemphasis are:

- Studies related to pharmaceutical waste dumping near Puerto Rico
- Studies on brine disposal from strategic petroleum reserve salt domes
- Studies related to petroleum development in the Pacific Northwest

- Studies of the human health effects of at-sea dumping of sewage sludge
- Studies on the distribution and effects of elemental heavy metals, e.g., Hg, Cd, Cu, Pb, Zn, and Cr
- Development of bioassays that use organism death as the end point, especially as they relate to petroleum and petroleum products

B. Management and Technical Recommendations

The analysis reported in this document indicates that several broad program areas require attention in order to improve the efficiency and timeliness of the overall federal effort. In general, the design of research and development programs should focus on synergistic effects and studies emphasizing ecosystem level impacts of multiple pollutants. National monitoring activities should be more clearly defined to include non-Federal programs and should be concentrated initially in geographic areas subject to maximum pollutant stress from human activity. Attention should be directed at a broad effort to increase emphasis on quality assurance in data collection, handling, and analysis. Federal efforts to develop the measurement technology necessary to support ocean pollution research and monitoring should be expanded and better coordinated to provide scientists with a suite of reliable, cost-effective tools. Finally, data and information collection, analysis, and dissemination efforts should be improved so that maximum use can be made by scientists and decisionmakers of the results of Federal as well as non-Federal ocean pollution programs.

1. Research

A reliable information base required for management of ocean resources must be based on a foundation of solid research; and in the present budget climate, an effective, coordinated research program is a necessity. The main body of this report identifies a number of scientific and technical areas that must be addressed to provide this information base. In addition, several broad research areas that cut across many disciplines have been noted as deserving increased program planning and coordination. Recommended actions to address these broad areas of concern are as follows:

a. Initiate long-term studies on natural ecosystems that are not affected by human activities. Interdisciplinary efforts such as this are needed to provide an understanding of natural ecosystem variability.

b. Assess the economic and social impacts of pollution to develop information needed by decisionmakers. While not a classical scientific research area, these studies are necessary to support rational, equitable decisions on development and conservation of marine resources.

c. Continue efforts to develop a basic understanding of physical and chemical oceanic processes.

d. Identify new and potential ocean pollutants before problems become acute or damage to the environment is irreversible, and develop the capability to predict pollutant behavior and effects. This effort, which must involve evaluation of new industrial processes and chemicals as well as classical ocean pollution studies is necessary to avoid future incidents such as Kepone pollution of the James River or PCB contamination of the Hudson River.

e. Continue and expand international programs dealing with ocean pollution problems. The oceans are a global commons, and international cooperation is needed to ensure that the global ocean ecosystem is preserved for future generations as a viable, self-renewing system.

2. Monitoring

Federally sponsored monitoring programs fall into four categories:

Monitoring of pollutant inputs,

Monitoring of marine ecosystems,

Monitoring of food resources, and

Monitoring of spills of oil and hazardous materials.

The Monitoring Subcommittee of the Interagency Committee has analyzed the Federal effort in depth and concluded that present activities are by and large adequate with the exception of work directed at assessing the health of marine ecosystems. This shortfall is due to a lack of centralized planning for coordination, accountability, and information retrieval. Other deficiencies noted in the Subcommittee analysis relate to inadequate efforts to develop effective monitoring strategies, standard bioassay methodology, and more cost-effective measurement and analysis methodology, as well as a lack of stringent quality assurance programs in measurement and analysis. The primary strategy recommended by the Subcommittee as a means of improving this situation is the establishment of an overall national ocean pollution monitoring program that would take account of discrete Federal, State, and local monitoring programs and ensure that they are responsive to, or form a part of, regional monitoring strategies or plans. Specific recommendations are as follows:

a. Establish a Federal Monitoring Program to include:

- Federally funded and managed ocean pollution monitoring programs for each highly stressed U.S. coastal region.

- Development of detailed monitoring plans taking account of regional monitoring plans, unequal coastal population density and industrial development, and regionally different weather and oceanic climate. The following regional divisions should be considered: Great Lakes, northeast Atlantic coast, southeast

Atlantic coast, Gulf of Mexico coast, southwest Pacific coast, northwest Pacific coast, and Alaska coast. The regional plans and their implementation should be approved and coordinated by a management group (e.g., NOAA, EPA) under the aegis of an Interagency Steering Committee.

- Coordinated regional plans and monitoring activities should be implemented in FY 1981 as the first phase of a national program of ocean pollution monitoring. Because of critical pollutant stress conditions, public and institutional support, and the existence of a sufficient research base, the initial new monitoring efforts should be in the northeast Atlantic coast and Great Lakes regions.

b. Establish a Federal management and coordination structure to include:

- A management information system and a central data bank for all of the existing local, State, and Federal programs of marine pollution monitoring and their data.
- An Interagency Steering Committee to advise on the development of a National program of ocean pollution monitoring.
- A series of regional centers responsible for the synthesis of monitoring information and data into "management use" products.
- Establishment of guidelines for quality controls in monitoring data acquisition and analysis technology. Federally funded academic and industrial monitoring efforts should be required to follow the guidelines.
- Development of standardized formats for monitoring data acquisition.
- Increased efforts by Federal agencies to develop, test, and adopt standard marine bioassay methods for monitoring programs.
- Increased Federal efforts to advance the technology of monitoring instrumentation (sensor development) and the development of analysis methodology.

3. Technology

As noted earlier, technology development efforts are needed to support all facets of a comprehensive national program of ocean pollution research and monitoring. Most notable is technology related to cleanup and recovery of toxic pollutants and inspection of offshore facilities. Key recommendations for interdisciplinary efforts in technology development are as follows:

a. Expand interagency efforts to develop effective cleanup technology for spilled hazardous materials. This initiative should include involvement of private industry to the maximum practicable extent.

b. Increase efforts at the Federal level to develop techniques for monitoring the safety of offshore oil operations and the storage and transfer facilities for oil and hazardous materials. While these efforts are not directly related to ocean pollution development, they yield results that can reduce significantly the likelihood of pollutants reaching the marine environment.

4. Measurement Technology

Lack of adequate measurement capability is frequently the limiting factor in developing meaningful information on ocean pollution problems. Increased automation and the provision of better tools for use in monitoring and assessment could increase efficiency in this area. The following actions are recommended to coordinate the diverse efforts throughout the agencies and the public sector and to increase emphasis on measurement technology to an appropriate level.

a. Define and evaluate program requirements and recommend development efforts for improvement of measurement technology based on the current and projected needs of ocean pollution programs. Evaluation should include consideration of nonmarine programs and requirements, because measurement systems are often closely related.

b. Encourage development of required sensors, equipment, techniques, and methods through the initiation of such mechanisms as cooperative development agreements between interested agencies, identification of high priority development needs for private sector investment, and identification of high-priority development needs for pooling of resources by appropriate funding organizations.

c. Encourage standardization of equipment and techniques for operational programs whenever possible.

5. Quality Assurance

Quality Assurance is a necessary element in all data collection programs -- both for legally defensible regulatory programs and for assurance that collected information can be of utility to users other than the original data collector. The following actions are recommended to encourage the establishment of adequate quality assurance activities:

a. Establish a centralized working group for coordinating a quality assurance program for marine data and measurements from all Federal ocean pollution research, development, and monitoring activities. The Council on Environmental Quality is pursuing similar quality assurance problems, and efforts should be closely coordinated through an interagency group established with a formal Charter and work plan.

b. Establish broad quality assurance guidelines and minimum requirements for all federally funded programs of ocean pollution research and monitoring. These guidelines should include specifications for appropriate handbooks, standard methods and equipment, laboratory and field testing, calibration and intercalibration procedures, and reporting requirements. Where such tools do not exist, the working group should promote their development. All relevant federally funded programs should be required to adhere to the minimum standards set in the guidelines, and all agencies should be required to establish their own quality assurance programs conforming to the guidelines. Managers of privately funded programs should be encouraged to establish similar programs.

6. Data and Information Dissemination

To better manage and assure maximum benefit from ocean pollution research and monitoring programs, information must be available in a timely manner and in easy to understand forms. The following actions are recommended:

a. Establish an information system for ocean pollution research, development, and monitoring programs. An appropriate existing system such as the SSIE or the DOE Energy/Environment Information System should be modified, if at all possible, to meet the requirements for such a system.

b. Coordinate the network of existing data centers by encouraging the use of standardized formats and reporting procedures to assure that data collected through ongoing and new operational programs can be more efficiently used for multiple purposes.

c. Develop a centralized capability to analyze, organize, and present results thorough coordination of information from diverse agencies. Such reports should be assembled as state-of-knowledge documents on the basis of pollution sources, pollutants, and geographical regions, and should be made available to all interested users.

d. Privately funded programs of ocean pollution research, development, and monitoring should be inventoried on a regional basis and combined with the catalog of Federal programs to provide a more comprehensive basis for analysis of the adequacy of the Federal programs in responding to overall needs.

e. Forums for information exchange, including periodic workshops and conferences at the national and regional level, should be organized and supported by Public Law 95-273 funds to bring together scientists and decisionmakers concerned with specific ocean pollution problems. Current knowledge and the results of past studies should be integrated, interpreted, and published as up-to-date statements of all available information on pollution problems.

C. Recommended Tasks

The departments and agencies involved in the Federal efforts on ocean pollution research, development, and monitoring must take action if the recommendations set out in this chapter are to yield improvement in the overall program. To that end, the Interagency Committee recommends that the following specific tasks be undertaken to implement the recommendations of Federal Plan No. 1 and to improve subsequent Federal Plans.

Task 1: A systematic review of Federal mission agency and state/local government roles should be conducted to identify appropriate Federal and non-Federal government entities to address identified problem areas. Where necessary, appropriate mission agencies in the Federal Government should develop program initiatives in these areas and seek funding through changes in program emphasis or reprogramming; State and local authorities should be encouraged to review their activities in these areas to determine if they are adequate and appropriate to fill gaps in the Federal effort and to address regional problems where appropriate.

Task 2: A systematic review of Federal mission agency and state/local government programs in these areas should be conducted. This review should include identification of each agency's mission and mandate in the area; an evaluation of agency expertise in the area; a thorough definition of the goals, techniques, resources and equipment, geographic areas of interest, and management implications of each project; a search for gaps that could be filled or problems that could be solved by cooperation between agencies; and a search for overlapping or duplicative efforts that could be eliminated.

Task 3: Development of a report on the status of each subject area, including the state of the technology, available information, and unanswered questions. This report would be used as a measuring stick in evaluating the overall Federal effort in the area. On the basis of that evaluation, alternative approaches for improving effectiveness and efficiency in these areas would be developed, ranging from simple publication of a report spelling out the information gained as a result of the in-depth review to detailed proposals for legislative action.

Task 4: Assure that long-term studies on natural ecosystems not impacted by human activities are begun by appropriate Federal agencies.

Task 5: Foster development of an improved Federal capability to assess the economic and social impacts of pollution in order to develop information needed for pollution control decisions.

Task 6: Assure that efforts are continued to develop a basic understanding of physical and chemical oceanic processes necessary to support pollutant behavior and effects studies.

Task 7: Improve the ability of Federal research, development, and monitoring programs to identify new and potential ocean pollutants and predict their effects before problems become acute or damage to the environment is irreversible.

Task 8: Establish an interagency working group with a formal charter and work plan to develop an effective and efficient National ocean pollution monitoring plan for inclusion in the 1981 Federal Plan. The development of the monitoring plan should include an assessment of all existing federally funded ocean pollution monitoring programs and should take account of state managed ocean pollution monitoring programs.

Task 9: The interagency working group established in Task 8 will ensure that the National ocean pollution monitoring plan includes a mechanism for integrating existing monitoring data and information systems so that all relevant monitoring data and information is available to users. The plan should also include a means for converting monitoring data and information into forms useful in making decisions on ocean pollution control.

Task 10: Foster expanded interagency effort to develop improved cleanup technology for spilled hazardous materials. This initiative should be coordinated by the National Response Team. Development of technology in this area should rely on involvement of private industry to the maximum extent practicable.

Task 11: Assure that efforts at the Federal level to develop techniques for assessing the environmental protection aspects of offshore oil operations, and storage and transfer facilities for oil and hazardous materials are coordinated and expanded where necessary.

Task 12: Evaluate research and monitoring program requirements, including measurements of interest, precision, and measurement frequencies, and recommend improvements in measurement technology to meet established requirements.

Task 13: Encourage development of required sensors, equipment, techniques, and methods though the initiation of cooperative development agreements between interested agencies; the identification of high-priority development needs for private sector investment; and pooling of resources by appropriate funding organizations.

Task 14: Encourage standardization of equipment and techniques for operational monitoring programs whenever possible.

Task 15: Establish an interagency working group with a formal charter and work plan to develop a coordinated marine data quality assurance program plan for all federally funded ocean pollution research and monitoring activities. This plan, which will form a part of the 1981 Federal Plan, should address the need for compatible reporting formats and for correctly storing and disseminating data, along with relevant information on methodology, accuracy, and error bounds. This effort should be recognized in the National Ocean pollution monitoring plan to be developed by the interagency working group described in Task 8. It is not the intent of this plan to constrain innovative research. As the Council on Environmental Quality (CEQ) is also pursuing problems of data quality assurance in government research and monitoring programs, the working group established under this task should closely coordinate their efforts with those of CEQ.

Task 16: The interagency working group should also ensure that broad quality assurance guidelines and minimum requirements for all federally funded ocean pollution monitoring programs are included in the plan. These guidelines should include specifications for use of appropriate handbooks, standard methods and equipment, laboratory and field testing, calibration, and intercalibration procedures. Where such tools do not exist, their development should be called for in the plan. All relevant federally funded monitoring programs should be required to adhere to the minimum standards set in the guidelines, and all agencies should be required to establish their own monitoring quality assurance programs conforming to the guidelines.

Task 17: Organize an interagency working group to advise on (1) coordination of the network of existing data centers by encouraging the use of standardized formats and reporting procedures to assure that data collected through ongoing programs can be more efficiently used for multiple purposes, and on (2) development of a centralized capability to analyze, organize, and present data and documentary results by coordination of information from diverse agencies into present state-of-knowledge reports on pollutants, sources of pollution, and the health of the environment in various geographic regions. Recommendations should be included for cost sharing by benefitting Federal and non-Federal programs. As the Council on Environmental Quality has an existing Environmental Data and Monitoring Task Force, this work should be coordinated or combined with the efforts of that group.

Task 18: Inventory non-Federal programs of ocean pollution research, development, and monitoring on a regional basis and combine this information with the catalog of Federal programs that has been developed during implementation of the Act. This will provide a more comprehensive basis for analyzing the adequacy of Federal activities in responding to overall needs.

Task 19: Organize selective multidisciplinary forums, conferences, and workshops at both the national and regional level where definite benefits can be achieved. These efforts should bring together scientists and decisionmakers concerned with specific ocean pollution problems. They should lead to integration of current knowledge with the results of past studies, interpretation of project results, and publication of up-to-date statements of relevant available information on specific problems.

Task 20: Establish a National Marine Pollution Program Office at a high level within NOAA to assist NOAA and the other agencies in carrying out the Act and the recommendations in the Federal Plan. Part of the staff of this Office should be full time representatives of the other principal agencies involved in ocean pollution research, development, and monitoring. The National Marine Pollution Program Office, as staff to the chairman of the Interagency Committee on Ocean Pollution Research, Development, and Monitoring, will assist the chairman and committee in ensuring implementation of the recommendations of the Federal Plan and preparing future Federal Plans.

Task 21: Develop clear guidelines for implementation of Sections 5, 6, and 8 of the Act within NOAA. These guidelines should place responsibility for specific sections of the Act and explain how NOAA will ensure that its ocean pollution activities are consistent with the Act.

Task 22: Establish the present Interagency Committee on Ocean Pollution Research, Development, and Monitoring as the policy level interagency group responsible for implementing the National Ocean Pollution Research and Development and Monitoring Planning Act of 1978 (Public Law 95-273). The National Marine Pollution Program Office established under Task 20 will act as staff to the Chairman of the Interagency Committee as the Committee carries out this role.

Task 23: Develop a multiyear prospectus for ocean pollution research, development, and monitoring activities within the agency. This prospectus should reflect the agency's consideration of Federal Plan No. 1 and should be used in developing future Federal Plans.

Task 24: Assure that agency plans which focus on specific mission requirements and individual budget concerns are, to the maximum extent practicable, consistent with Federal Plan No. 1 and with future Federal Plans.

Task 25: Cooperate with the Chairman of the Interagency Committee in developing a coordinated budget review process, as required by the Act, for assuring that individual agency and overall Plan priorities are reviewed and coordinated in a systematic fashion.

APPENDIX A: INTERAGENCY COORDINATION PROCESS

The Interagency Committee on Ocean Pollution Research and Development and Monitoring (Interagency Committee) was created in June 1978 under the auspices of the Federal Coordinating Council for Science, Engineering, and Technology in the President's Office of Science and Technology Policy. NOAA's Deputy Administrator serves as chairman. EPA's Assistant Administrator for Research and Development is the Vice Chairman. Federal departments or agencies having significant involvement in ocean pollution research, development and monitoring are represented on the Committee. These are:

Department of Agriculture
Department of Commerce
Department of Defense
Department of Energy
Department of Health, Education, and Welfare
Department of the Interior
Department of Transportation
Environmental Protection Agency
National Aeronautics and Space Administration
National Science Foundation
Nuclear Regulatory Commission
Council on Environmental Quality
Office of Management and Budget

The Interagency Committee formed four working Subcommittees to develop specific portions of the 5-year Federal Plan required by Section 4 of the Act. The subcommittees were:

National Needs and Problems, chaired by the principal representative of EPA, with responsibility for developing a statement of National needs and problems related to ocean pollution research, development and monitoring based on input from Federal program managers, scientists, industry, public interest groups, State and local government planning agencies, and groups involved in adjudication of environmental issues.

Research and Development, chaired by the principal representative of the NSF, responsible for assessing the adequacy of present Federal efforts in ocean pollution research and development and making recommendations to the Interagency Committee on necessary changes to the program.

Monitoring, chaired by the principal representative of the Commerce Department, responsible for assessing the adequacy of present Federal efforts in ocean pollution monitoring and making recommendations to the Interagency Committee on necessary changes to the program.

Data Collection, Storage, and Distribution, chaired by the principal representative of the Department of the Interior, responsible for assessing the adequacy of present Federal efforts in this area and making recommendations to the Interagency Committee on design of a system to make better use of the results of Federal ocean pollution studies in decisionmaking processes relating to development and conservation of ocean resources.

In addition to these working Subcommittees, a Federal Plan Task Force Office was established; it was comprised of representatives of the Interagency Committee as well as the National Response Team, (an interagency coordinating body responsible for research and development on response to spills of oil and hazardous substances). The Federal Plan Task Force Office was responsible for developing Federal Plan No. 1 based upon the reports of the Subcommittees.

APPENDIX B: WORKING PAPERS OF THE INTERAGENCY COMMITTEE ON OCEAN POLLUTION RESEARCH AND DEVELOPMENT AND MONITORING

1. Federal Ocean Pollution Research, Development, and Monitoring Programs, Fiscal Year 1978-1980, July 1979.

2. First Report of the Subcommittee on National Needs and Problems, May 1979, prepared under the direction of Stephen Gage, Assistant Administrator for Research and Development, United States Environmental Protection Agency.

3. Report of the Subcommittee on Data Collection, Storage, and Distribution, April 1979, prepared under the direction of H. William Menard, Director, United States Geological Survey.

4. Report of the Subcommittee on Monitoring, July 1979, prepared under the direction of Ferris Webster, Assistant Administrator for Research and Development, National Oceanic and Atmospheric Administration.

5. Report of the Subcommittee on Research and Development, March 1979, prepared under the direction of John Slaughter, Assistant Director for Astronomical, Atmospheric, Earth, and Ocean Sciences, National Science Foundation.

6. Proceedings of Workshop on Scientific Problems Relating to Ocean Pollution, July 10-14, 1978, Estes Park, Colo., Edward D. Goldberg (ed.), March 1979. Environmental research Laboratories, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, PB 297 467

7. Proceedings of a Workshop on National Needs and Priorities for Ocean Pollution Research and Development and Monitoring, November 14-16, 1978, Tysons Corner, Va., May 1979. Office of Research and Development, U.S. Environmental Protection Agency.

Copies of working documents are available from:

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22121

APPENDIX C: ACRONYMS AND WORKING DEFINITIONS

I. Acronyms

AEC	Atomic Energy Commission
APHA	American Public Health Association
ASTM	American Society for Testing and Materials
BLM	Bureau of Land Management
BOD	Biological oxygen demand
CEPEX	Controlled Ecosystem Pollution Experiment
CEQ	Council on Environmental Quality
CHEMTREX	Chemical Transportation Emergency Center
CHRIS	Chemical Hazards Response Information System
COE	Army Corps of Engineers
COPRDM	Interagency Committee on Ocean Pollution Research, Development, and Monitoring
CVS	Commercial Vessel Safety Program
DOC	U.S. Department of Commerce
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOI	U.S. Department of the Interior
DOMES	Deep Ocean Mining Environmental Studies
DOT	U.S. Department of Transportation
ENDEX	Environmental Data Base Index
EPA	Environmental Protection Agency
FDA	Food and Drug Agency
FWPCA	Federal Water Pollution Control Act

FWS	Fish and Wildlife Service
GEOSECS	Geochemical Ocean Sections Study
GLERL	Great Lakes Environmental Research Laboratories
HACS	Hazard Assessment Computer System
HEW	U.S. Department of Health, Education, and Welfare
HERL	Health Effects Research Laboratory
IDOE	International Decade of Ocean Exploration Program
IMCO	Inter-Governmental Maritime Consultative Organization
LNG	Liquefied natural gas
MESA	MarineEcosystems Analysis
MARAD	Maritime Administration
MEP	Marine Environmental Protection
NASA	National Aeronautics and Space Administration
NAWDEX	National Water Data Exchange
NBS	National Bureau of Standards
NIEHS	National Institutes of Environmental Health Services
NIH	National Institutes of Health
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
NRC	Nuclear Regulatory Commission
NSF	National Science Foundation
NSSP	National Shellfish Sanitation Program
NTIS	National Technical Information Service
OCSEAP	Outer Continental Shelf Environmental Assessment Program
OCS	Outer continental shelf
OHM-TADS	Oil and Hazardous Materials Technical Assessment

OMB	Office of Management and Budget
ORP	Evaluation of Radioactive Waste Dump Sites
OSTP	Office of Science and Technology Policy
OTEC	Ocean Thermal Energy Conversion
OWHM	Ocean Dump Site Evaluation Program
RCRA	Resource Conservation and Recovery Act
R & D	Research and development
R,D&M	Research, Development, and Monitoring
SPRO	Strategic Petroleum Reserve
SSC	Scientific Support Coordinators
SSIE	Smithsonian Scientific Information Exchange
STORET	Storage and Retrieval for Water Quality Data
TOSCA	Toxic Substances Control Act
UNEP	United Nations Environment Program
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey

II. Working Definitions

The following tentative definitions were agreed upon by the Interagency Committee that developed the first Federal Plan required by P.L. 95-273.

a. Marine environment -- the coastal waters (including the lands therein and thereunder), and the adjacent shorelands (including the waters therein and thereunder), strongly influenced by each other in proximity to the shorelines of the several coastal States, including islands, transitional and intertidal areas, salt marshes, wetlands, and beaches. Also included are the waters of the Great Lakes, to the international boundary between the United States and Canada, the seabed, subsoil, and waters of the territorial sea of the United States; the waters of any zone over which the United States asserts exclusive fishery management authority; the waters of the high seas; and the seabed and subsoil of and beyond the Outer Continental Shelf.

b. Ocean pollution -- the results of human activities that cause, directly or indirectly, deleterious effects on the condition of the ecosystem, hazards to human health, or reductions in socioeconomic or esthetic quality of the marine environment.

c. Research -- studies, scientific experimentation, investigations, and surveys to:

  - improve basic understanding of the natural processes of the ocean with respect to ocean pollution, including chemistry, currents, seasonal changes, ocean-atmosphere interactions, benthic-water column interactions, and behavior and dynamics of living populations;

  - identify the behavior, fate, and effects of pollutants and potential pollutants, including their rates of introduction into the marine environment, chemical and physical behavior, toxicity, assimilation rates, and chemical, physical, and biological concentration and degradation modes; and

  - evaluate the deleterious effects of pollutants and potential pollutants on the condition of the ecosystem, on human health, and on the socioeconomic and esthetic quality of the marine environment.

d. Technology Development -- efforts to provide the technology needed to limit the introduction of pollutants into the marine environment and to mitigate the effects of chronic and catastrophic introduction of pollutants into the marine environment; and to provide the analytical methods, instrumentation, and equipment necessary for these efforts and for research and monitoring of ocean pollution.

e. Monitoring -- the systematic measurement of marine conditions over sufficient periods of time to:

- establish existing levels of marine pollutants;
- assess potential hazards to human health;
- assess changes in ecosystem health and in marine biota relevant to their use as living resources; and
- assess long term trends in marine pollution levels.

Note: Ocean pollution monitoring does not include basic research into natural processes and phenomena per se.

APPENDIX D: PUBLIC PARTICIPATION

The Director of the President's Office of Science and Technology Policy and the Chairman of the Interagency Committee on Ocean Pollution Research and Development and Monitoring made strong commitments to maximum public participation in development of the first Federal Plan. Non-Federal interests have been involved in the process from its inception. Representatives of colleges and universities in Canada and the United States participated in the Workshop on Scientific Problems Related to Ocean Pollution held at Estes Park, Colo., July 10-14, 1978. To develop a comprehensive statement of the national ocean pollution research, development, and monitoring problem, Members of diverse State and local government planning agencies, public interest groups, industry, and groups involved in adjudication of environmental issues attended the National Needs and Problems Workshop held at Tysons Corner, Va., November 14-16, 1978.

Finally, the following organizations extensively reviewed and commented on the first draft of the Federal Plan.

American Institute of Merchant Shipping
American Petroleum Institute
Center for Law and Social Policy
Council of State Governments
Great Lakes Basin Commission
National Advisory Committee on Oceans and Atmosphere
National Fisheries Institute
National Ocean Industries Association
National Wildlife Federation
Natural Resources Defense Council

In late April 1979, key representatives were briefed on the contents of the draft Federal Plan and were given review copies. They were asked to bring their written comments to a debriefing session in mid-May. Despite the time limitation, all participants responded with in-depth comments, which are given at the end of this appendix. The suggestions and criticisms, which cover both general and specific aspects of a broad range of subjects, were used extensively in revising the first draft of the Federal Plan. For example, in response to the comments of several groups, the discussion of the effects of ocean pollution on living resources was rewritten and expanded for greater emphasis on the generic effects of pollutants on marine organisms. Another example is the section on special regional problems of the Great Lakes. Prompted by suggestions of the Great Lakes Basin Commission, that section was extensively rewritten to convey several needs for research on pollution problems.

Several other suggestions, concerned primarily with the manner in which the entire process of plan development was carried out, were received too late for adequate consideration in the first version of the Federal Plan; however, these will be a valuable aid in the preparation of the required 1981 revision.

The public comments were especially useful in preparing the section of the analysis concerning priorities for the various research, development, and monitoring needs. The first draft included tentative priorities within broad categories and within more specific subcategories. A number of these priorities were changed after consideration of the suggestions and supporting rationale provided by the public reviewers. For example, studies on entrainment and impingement of organisms at steam electric powerplants and on brine-producing activities have both been raised from low to medium priority; studies on ocean dumping of dredged materials have been raised from medium to high priority; and studies on wastes from fish and shellfish processing have been reduced from medium to low priority.

Public and Federal reviewers have performed a most valuable service in providing their views. Their cooperative efforts are greatly appreciated, and the views of these and other interested individuals will be enthusiastically welcomed in the preparation of the first biennial revision of the Federal Plan.

TO: Lowell Martin, NOAA, (by hand) May 14, 1979

FROM: Paul Hammer, American Institute of Merchant Shipping (AIMS)

SUBJECT: General Comments on FPOPR, D & M

1. AIMS participation in review is a deeply appreciated opportunity.

2. AIMS participation in review should not be construed as concurrence in the Draft Report, its format, conclusions, or recommendations; or in statements by reviewers.

3. Overall the report seems to be a collection of non-representative "bits and pieces" with many self-serving statements, conclusions, and recommendations which appear to reflect individual assessments rather than agency policies, plans, or priorities. May have resulted from lack of standard definitions and criteria for R, D & M projects to be covered to which all participants would be bound.

4. Report has wandered deeply into regulatory assessment toward justification of expanded operational, design, and equipment requirements. It is not felt that this was the objective of the Act.

5. Report includes non-germane discussion and support for unwarranted or unsubstantiated conclusions. This is furthered by inclusion of very elemental or misleading statements.

6. Cannot comment on any specifics of Section C-5 because we feel that:

a. The subjects included are not representative of R, D & M projects pertinent to marine transportation. For example, inputs from the following relative to ongoing projects/expenditures are missing:

- USCG other than limited WEP
- Maritime Administration relative to all R & D
- NOS/DMA relative to charting & survey
- NASA relative to SEASAT and follow-on ocean weather/sea state satellite projects

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b. The "analysis" and "needs" sections address regulatory rather than R, D & M matters. Their treatment is cursory.

c. Current formal USCG rulemaking proceedings relative to 1978 TSPP Protocols of 1973 MARPOL and 1974 SOLAS have over-run the included subjects and discussions.

7. In conclusion we do not feel that the report meets the objectives or mandates of the Act relative to R, D & M matters involving and impinging upon marine transportation.

8. These comments have been hand drafted during the meeting after being informed that "comments not submitted in writing by close of business today will not be considered". They reflect discussions during the meeting, staff response to questions, and analysis of documents available to the reviewers for the first time during the meeting.

American Petroleum Institute
2101 L Street, Northwest
Washington, D.C. 20037
202-457-7000

MAY 14, 1978

Mr. James P. Walsh
Deputy Administrator, NOAA
Chairman, Interagency Committee on Ocean Pollution
United States Department of Commerce
National Oceanic and Atmospheric Administration
Office of the Administrator
Washington, D. C. 20230

Dear Mr. Walsh:

Thank you for the opportunity to review the "Federal Plan for Ocean Pollution Research, Development and Monitoring, 1979 - 83." The views expressed here can not be interpreted to represent an API consensus position for several reasons. The two-weeks allowed for review is mechanically inadequate. The absence of the "working papers" prevents evaluation of the quality of the judgements and recommendations. The hasty drafting of the document has lead to ambiquities and omissions.

With these limitations, our views are presented in good faith and with no little sympathy for the committee and its staff, whose time pressures were enormour.

Our first observation is that the Interagency Committee and its Task Force had few if any economists. The enabling act in Section 4(b)(A) specifies an assessment of "effects of ocean pollution on the economic, social, and environmental values of ocean and coastal resources." It might be desirable to include an economist or two on the task force developing future versions of the "Plan."

Section II B, concerning Regional Efforts, could be improved by the addition of a section covering issues shared by all regions--and there are several. For example: Damage assessment of hazardous material spills; powerplant and major industrial sitings; hazardous waste disposal; environmental monitoring; wetland and estuarine assessment; identification of sensitive habitats.

An equal opportunity employer

The suggestion is more than editorial, because such a grouping would serve to identify in a special way major national issues. The summary of common needs, because of organizational limitations, does not identify the above needs as common.

A final comment has more to do with management philosoply than with content. The Committee and Task Force members represent a variety of talents and diverse national interests. The agencies they represent go through tough internal battles each year to propose and defend ocean-related research. This rich diversity, we are now being told, is less useful than one master plan, devised in a rush, by a handful of representative talents.

We believe tha nation can be well served by a diversity of approaches to national problems. Each additional constraint on the imagination of our research directors must be ruefully condemned.

The national accounting for research programs is another matter. We believe it can be useful indeed.

Sincerely,

Thomas G. Hanney

CENTER
FOR
LAW
AND
SOCIAL
POLICY

[illegible] D.C. 20036 [illegible] 872 0670

James N. Barnes
Randy I. Bellows•
Nancy Duff Campbell
Clifford E. Curtis
Roger [illegible] Foster
L. Thomas Galloway
John W. Garland
Marcia D. Greenberger
Margaret A. Kohn
J. Davitt McAteer•
Richard S. McMillin
Leonard C. Meeker
Sanford A. Newman•
Carol Oppenheimer
Marilyn G. Rose
Andrew Jay Schwartzman
Herbert Semmel
Harvey J. Shulman
Attorneys at Law
• Not admitted in D.C.

15 May 1979

Lowell Martin, Executive Secretary
Office of Policy and Planning
National Oceanic and Atmospheric
Administration
U.S. Department of Commerce
WSC5 (Room 927)
6010 Executive Blvd.
Rockville, MD 20852

RE: April 1979 Draft of the Federal Plan for Ocean Pollution Research, Development, and Monitoring, 1979-83

Dear Mr. Martin:

The Center for Law and Social Policy has followed with considerable interest the 5-year Plan which NOAA has been preparing pursuant to the National Ocean Pollution Research and Development and Monitoring Planning Act of 1978. We have reviewed the April 1979 First Draft which was made available to us on April 30, 1979, and offer the following comments for your consideration.

We strongly endorse the intent of P.L. 95-273 to provide effective and coordinated directives for the entire federal effort relating to ocean pollution research and monitoring. Given NOAA's ocean-related responsibilities vested in it pursuant to Reorganization Plan No. 4 in 1970 and subsequent statutory mandates, it was appropriate that NOAA be given the lead agency role in this effort.

NOAA has undertaken a massive task under unrealistic time deadlines and deserves considerable praise for what it has accomplished thus far. The Plan's analysis of the current federal effort, looked at from the perspective of pollutants, regions, and sources (pp. II-1 through II-132) provides valuable information and insights with respect to existing activities. Similarly, the Plan's "National Needs" section (pp. III-1 through III-49) represents a major step towards establishing priorities by which the needs and attendant problems should be met, as required by P.L. 95-273. We also recognize the considerable difficulties associated with preparing a comprehensive inventory of "pollution-related" activities, and appreciate the candid manner in which NOAA acknowledges the problems it has encountered in meeting its responsibilities for that portion of the plan.

While recognizing the substantial accomplishments which have been achieved under NOAA's direction in preparing this first 5-year Plan, however, we do find that the April 1979 draft is deficient in certain major respects which make it extremely difficult for us to offer any detailed comments at this time. Most importantly, the draft Plan fails to include the policy recommendations and initial set of goals, matters which are the heart of the 5-year Plan. While the draft indicates that "[r]ecommendations will be developed by the Interagency Committee... based on the analysis in this document and comments by reviewers" (I-3), and that the goals will be based on "the analysis in this document..., the general findings, and recommendations of committee members and reviewers" (Id.), critiquing the Plan in the absence of such recommendations and goals is virtually impossible. While we might disagree in certain instances with the assessment of the common needs and the high-, medium- or low-priority rankings of the needs for regional impacts and sources of pollution contained in the draft, such a critique and analysis of the Plan's adequacy is impossible until the overriding policy recommendations and goals of the type required by Section 4(b)(3) of P.L. 95-273 are spelled out.

Given the unrealistic time frame under which the first 5-year Plan is being produced, there has been a general consensus that this first Plan could not be expected to represent a comprehensive treatment of its statutorily mandated components. At the Tysons Corner workshop convened under NOAA's direction November 14-16, 1978, we encouraged the principal draftsmen of the Plan to make it very clear that the first 5-year Plan, while representing a major first step, would be only a rough draft of the next biannual update. We reiterated these concerns at the April 30, 1979 briefing which accompanied distribution of the draft Plan. The incompleteness of the inventory, the lack of budgetary information " in the time frame available" that would allow inventory projections into future years (I-3), and the short time period alloted to developing the policy recommendations (and goals), clearly evidence the fact that this Plan represents only a rough cast which needs much additional material and considerable shaping. This fact needs to be stated much more clearly at the very beginning of the "Overview".

Additionally, the opportunities for significant public participation in developing the Plan need to be improved. We find it very troubling that the Plan's policy recommendations will be developed by NOAA in consultation with the 13-member interagency task force, but without any opportunity for public participation. While we recognize the time limitations under which NOAA is operating, the deadline extension for submittal of the Plan to Congress and the President must accommodate the need for non-governmental review of the final work product. The failure to include such a review significantly undercuts the opportunities for public participation.

As stated at the outset, considerable progress under NOAA's direction has been made in developing the first 5-year Plan. We look forward to working with you and others involved in this effort as the process further unfolds.

Sincerely yours,

Clifton E. Curtis
James N. Barnes

The Council of State Governments

May 14, 1979

Mr. Lowell Martin
NOAA Office of Policy and Planning
WSA-5
6010 Executive Blvd.
Rockville, Maryland 20852

Dear Mr. Martin:

Thank you for the opportunity to review the Federal Plan for Ocean Pollution Research, Development and Monitoring. The draft report is a thorough first step toward implementing a continuing process for coordination of the $155 million federal ocean pollution program.

In our review we called upon the CSG regional offices to comment on the needs assessment and research priorities from a state and multi-state perspective. Their response indicates a general concurrence with the preliminary regional priorities contained in the draft.

We are specifically interested in the priorities assigned to the major source categories. States are currently engaged in environmental/natural resource efforts (many under federal mandate) which require substantial program commitments. Coastal zone management, water quality, hazardous materials, solid waste, and energy impact programs are being developed and administered in most or all of the 35 coastal states and territories. Many coastal states also depend heavily on water-related industries: fisheries, ports, mining and recreation. We feel very strongly that federal ocean research should support both these federal/state cooperative programs and the development of economic resources. The source priorities appear to adequately address our concerns.

The concept of a coordinated federal effort to identify national needs, establish objectives and propose research, development and monitoring programs is one that we fully endorse. We look forward to receiving a copy of the final five-year plan and would appreciate the opportunity to participate in the biannual update process.

Sincerely,

H. Milton Patton

H. Milton Patton
Associate Director for
Environmental Resources

HMP/esa

P. O. BOX 11910, IRON WORKS PIKE, LEXINGTON, KENTUCKY 40578 - TELEPHONE (606) 252-2291

Great Lakes Basin Commission

FROM: Lee Botts, Chairman, Great Lakes Basin Commission

COMMENTS ON FEDERAL PLAN FOR OCEAN POLLUTION RESEARCH, DEVELOPMENT, AND MONITORING 1979-83

My name is Lee Botts, and I serve as Chairman of the Great Lakes Basin Commission. My comments are based on participation in the March, 1978, regional workshop in Madison and consultation with other representatives of Great Lakes interests and agencies during the past two weeks. The responsibility for interpretation and presentation here belong to me.

From March, 1978, to the present, there has been concern in the Great Lakes region about how Great Lakes research needs would be addressed in the five-year plan under PL 95-273. There were three bases for this concern:

1. The lack of knowledge, understanding and reponse from the NOAA representatives at the March, 1978, workshop.

2. The general lack of appreciation of Great Lakes problems, programs and interests in the Washington headquarters of the agencies represented on the task force.

3. The lack of direct involvement of Great Lakes interests in development of the plan, as reflected in the fact that no Great Lakes agencies or institutions were invited to participate in either the Estes Park or Tysons Corner workshops which are cited as the chief sources for the plan and the lack of representation on the Interagency Task Force.

Submitted to Interagency Committee on Ocean Pollution Research, Development, and Monitoring by Lee Botts, Chairman, Great Lakes Basin Commission, P. O. Box 999, Ann Arbor, Michigan 48106 (313/668-2333), on May 14, 1979

Unfortunately, the document under review today confirms the bases of our concern in the superficial way it has addressed Great Lakes issues. It is incomplete, inaccurate, and inadequate. My comments are organized under these headings.

INCOMPLETENESS

The Great Lakes region is discussed on pages II-64 to II-66. The discussio is too general to be used as a basis for any decisions.

In comparison with discussions of other regions, no specific sites or problems are addressed. It is apparent that there was no direct consultation with any of the participants in major Great Lakes research programs. At a minimum, the agencies that should have been consulted would include the five Great Lakes Sea Grant Colleges, the Environmental Protection Agency's Great Lakes National Program office, NOAA's own Great Lakes Environmental Research Laboratory, the Great Lakes Fishery Laboratory of the Fish and Wildlife Service, the EPA Large Lakes Research Laboratory, the EPA National Water Quality Laboratory, the International Joint Commission, the Great Lakes Basin Commission, and the North Central Division of the Army Corps of Engineers.

This section does not reflect awareness of the massive five-year Pollution from Land Use Activities Reference Group (PLUARG) study conducted by the International Joint Commission with participation by all the agencies listed above plus many others in both Canada and the United States. Nor does this discussion reflect awareness of the increasing consideration being given to the question of managing the Great Lakes as an ecosystem, rather than in terms of specific problems.

In general, the "plan" consists of ideas and concepts that can be justified individually but do not, as put together in this document, constitute a program. No attempt has been made to set forth a framework, such as the ecosystem idea could provide, for setting and addressing goals. Other elements could be in relation to human health and the social aspects of ocean (Great Lakes) pollution.

The plan seems to be focused on the natural science and technology aspects of ocean research. There is recognition of land uses and facility siting in the coastal zone; however, the weight of the plan is clearly on the traditional and ongoing federal research areas. If scientific and technological findings are to be successfully translated into policy and program, there must be related research activity in the social studies area. The institutional considerations should be a part of the informational base available to decision-makers and preferably should be investigated on a multi-disciplinary basis with the scientists and engineers! The legislation and its history would appear to support this observation of need. See Public Law 95-273 - May 8, 1978, Section 2(S.1617) Findings and Purposes (b) (2) "to develop the necessary base of information to support, and to provide for the rational, efficient, and equitable utilization, conservation, and development of ocean and coastal resources and" and the Report (to accompany S.1617) Background and Need for the Legislation: ". . . A disturbing aspect associated with the utilization and development of ocean and coastal resources is that, many times, ocean-related activities are not mutually compatible. There exists an increased level of conflict between such activities, and it should be the goal of the federal government to resolve such conflicts and provide for the rational, efficient, and equitable development, utilization and conservation of ocean and coastal resources. The resolution of such conflicts, which involves the assessment and evaluation of the trade-offs between national benefits accruing from these activities, cannot be accomplished without gaining a better understanding of the effects of man's activities on the marine environment . . . ."

The need for a more comprehensive setting for Great Lakes research is supported by the uniqueness of the Great Lakes system, the largest body of fresh water on earth, which contains 20 percent of the fresh surface water and the size of the population in the region. Study of in-water effects must be supplemented by information on transport and impacts of land-based and air pollutants.

This is not to say that in-lake monitoring and evaluation of pollutant effects do not require increased effort. One of the differences between the oceans and the Great Lakes is that whatever goes into the lakes remains within a relatively closed system for a long time. They are not flushed by tides.

The Great Lakes are physically different from the oceans. They constitute a fresh water hydrologic system of closed basins. Unlike estuaries, bays and coastal waters, they are subject to relatively long retention time of pollutants. The Great Lakes are under heavier use pressure in terms of pollution loading, industrial use, human population and recreation. The Great Lakes are a source of drinking water, and they are one of the major sources of fresh water in the world. Finally, the Great Lakes are recognized by the governments of the United States and Canada as the subject of the Great Lakes Water Quality Agreement. Then, too, the eight states in the Great Lakes basin and the relevant federal agencies are associated in the Great Lakes Basin Commission.

The fact of the closed system may be why the Great Lakes have repeatedly provided early warning to the world on such problems as DDT and pesticides, PCBs, mercury and mirex Jacques Cousteau has commented on the importance of the rivers and lakes as the cradle of the oceans.

Finally, the lack of attention to toxic substances as the most immediate and significant problem in the Great Lakes is very striking. One Great Lakes researcher commented to me that the way the report stresses eutrophication and ignores toxics, from the human health standpoint, is rather like chasing a mouse while being trampled by an elephant.

Research on transport and fate of toxic contaminants is especially urgent. Specific research needs include:

a. Transport of pollutants on suspended and resuspended particulates as related to dispersal from point sources or accumulation in local areas.

b. Accumulation and bioavailability of contaminants in bottom and suspended sediments.

c. Bioaccumulation from water and through food chains.

d. Biodegradation as a pathway for removal of contaminants from the system.

Research on effects of toxic contaminants both on human health and the aquatic biota are needed in the following areas:

a. Testing methods which measure the effect of contaminants at levels of exposure representative of the system.

b. Sublethal or chronic effects as well as acute toxicity.

c. Synergistic effects between contaminants.

In the public health area, exposure through food, water and/or body contact should be considered. Epidemiological studies should be undertaken of humans and organisms exposed to contaminants from the Great Lakes.

INACCURACY

Although eutrophication is correctly cited on page II-64 as a cause of water quality deterioration, and phosphorus input as the most important cause of eutrophication, the most important source of phosphorus is not cited, namely, point source discharges from sewage treatment plants and industries.

Although not referred to in connection with the Great Lakes, the gross misstatement concerning dredging on page II-83 is pertinent. The statement is that continued work on stabilization of dredge disposal sites could minimize the need for additional dredging in the future!

An important need in the Great Lakes is better understanding of what happens to sediments during dredging as well as after disposal. There is urgent need for research on how to remove toxic contaminants from sediments in such situations as Waukegan Harbor in Illinois. Near a drinking water intake at the bottom of this harbor are sediments containing thousands of parts per million of PCBs that local public health authorities urgently want removed. Yet we do not know whether it is safer to leave them or to try to remove them, nor if removal is attempted, how to do it.

There appear to be numerous errors in the funding citations in the document, to such an extent that it is impossible to determine their source or accuracy. For example, the diagram on page I-8 indicates that the Great Lakes received about an eighth of the total national funding for research, or $20 million. Yet on page II-65 $6 million is cited, and here it is impossible to tell whether this is total funding or 66% of total funding, and if so, what total.

The repeated proposed cuts in Great Lakes funding by the Environmental Protection Agency have been a matter of great concern, but it is not possible to tell how much of the reduction in total EPA funds stems from the Great Lakes cuts.

INADEQUACY

As far as the Great Lakes are concerned, the problem is that not enough detail is given in the document to determine adequacy. On page III-32, three needs are listed. We do not understand the first statement, either the phrase "multiple inputs of pollutants" or the call for special attention to the "nonuniformity of discharge from whole watersheds and even subbasins." The second need is for diagnostic management models of pollutant fates and effects, but we are not told whether existing models are known about or such details as whether inshore or open water issues will be addressed. As for the third need, again, the call for research on fates and effects of pollutants from diffuse sources ignores the importance of pollutants from point sources.

The draft report spells out correct research activity and needs concerning the environmental effects and control of oil pollution but does not recognize that the almost complete lack of research on oil pollution in the Great Lakes. Chronic inputs of petroleum from urban and industrial areas of the Great Lakes to the subarctic waters are probably as significant to the ecosystem as chronic petroleum inputs along the ocean coasts. Research is now being done in Lake Erie because of the strong interest in possible drilling for natural gas.

More generally, the document ignores the importance of international monitoring on the oceans and the Great Lakes. The international efforts are especially important on the Great Lakes because of the Water Quality Agreement with Canada and the many cooperative efforts that the two countries are carrying out.

The short time allowed for review did not allow adequate review of the entire report by all the Great Lakes interests that should have been consulted. Additional specific comments are attached.

In conclusion, again I must state that it is difficult to understand why more attention was not given to the results of the March, 1978, workshop in Madison, Wisconsin. It was our understanding that the purpose of the workshop was to set the stage for implementation of the act. Many of the recommendations from that workshop concerned matters raised in these comments. In particular, the importance of the idea of basing pollution control strategy in the Great Lakes on restoration of the ecosystem would have been understood if results of the workshop had been used. Obviously, reestablishment of ecosystems as they were before man changed the Great Lakes is not possible. Finding what is possible and how to do it depends on research, and the research needed is not identified in the draft report.

We have done the best we could in the past two weeks to provide comments. We strongly urge that the true importance of the Great Lakes be recognized in future versions of the five-year plan and that the process by which it is developed include more adequate consultation with Great Lakes interests.

# # # # # #

ADDITIONAL SPECIFIC COMMENTS

1. In the Great Lakes section (Regional Priorities, page III-32), the concern expressed about human health effects on page II-65 is not mentioned. This was a priority item in the Great Lakes workshop summary. However, the topic is discussed on page II-129.
2. On page II-66, the dollars for GLERL and Sea Grant appear to be in error.
3. I-1, change biannual to biennial.
4. I-3, par. 2 - Ocean pollution research by Sea Grant programs are funded 2/3 federal: 1/3 state. Therefore, in future plans Sea Grant effort should be shown as 150 percent of federal support.
5. I-8, fig. 3 - Should include percentage or dollar values in diagram, or should be accompanied by a table giving dollars and percentages for various regions.
6. I-6, figs. 1 & 2 - ditto.
7. II-8, 2 Synthetic Organic Chemicals - Note bioaccumulation factors for aromatic halogenated hydrocarbons. This is the key characteristic of these substances and should be strongly emphasized at the outset.
8. II-12, last par., 1.6 - Change "seawater" to "receiving water."
9. II-19, par. 2, last line - "effect of water use practices on Great Lakes fish" - not clear what this means, clarify or delete.
10. Section II.9. Great Lakes Region
    a. Introduction, 1.2 - "supply of high quality fresh water."
    b. Regional needs - check workshop needs.
    c. Present activities, 1.2 - add sources, fates and effects of pollutants.
    p. ii-65 last line and top page II-66 - "joint program between the two countries to improve the water quality of the Grat Lakes" - not to manage the resources or the Great Lakes basin.

11. II-66, page 2 - GLERL funding $2,538M on diagnostic models, etc. This is a very dubious statement - check GLERL's Technical Plan for 1979.

    d. Observations - Conclusions - Level of effort to understand fates and effects of pollutants to Great Lakes is not adequate.

NATIONAL ADVISORY COMMITTEE
ON
OCEANS AND ATMOSPHERE
3300 Whitehaven Street, N.W.
Washington, D.C. 20235

May 11, 1979

Mr. James P. Walsh, Chairman
Interagency Committee on Ocean Pollution
  Research, Development and Monitoring
Main Commerce, Room 5802
14th & Constitution Avenue, N.W.
Washington, D.C. 20230

Dear Mr. Walsh:

This letter conveys NACOA's initial evaluation of the "Federal Plan for Ocean Pollution Research, Development, and Monitoring, 1979-83," released in first draft form on April 30, 1979. In providing our input, we have been disadvantaged in two respects by the procedure which has been imposed. First, the unusually short reviewing schedule, allowing only two weeks for review and comment, presents obvious difficulties given that the document is lengthy and complex. Second, the document is incomplete, in that the "goals" and "recommendations" sections have been left blank. Our review would have been facilitated had the document contained some clue, even though in draft form, as to the interagency committee's overview of the matter. Our comments are offered, in summary form, as follows:

1. Content: It is our view that, in its present form, the document represents an inventory of Federal activities, but it is not a plan for the future. A plan should first define appropriate organizing principles, then catalog current activities with reference to those principles, and then identify the ways in which future activities might be re-oriented so as to meet the overriding objectives. We recommend that the Plan consider Federal marine pollution activities within three broad classifications: a) studies of a generic and long-term nature; b) studies which are site-specific or short-term in nature, and subject to a high rate of turnover; and c) development of measures designed to prevent and contain pollution. The levels of effort expended in each area should reflect a balanced approach to meeting all three types of problems.

2. Organization: One reason that the document falls short of a comprehensive plan may be that it was written by an interagency committee. We recognize the difficulties inherent in this approach, but Public Law 95-273, while mandating interagency cooperation, did not specify joint authorship. We recommend that NOAA assume more than the role of a coordinator or "referral" agency, and adopt a strong leadership role. While we recognize that this would be an easier undertaking for an independent oceans agency, as recommended by NACOA's position on government reorganization, we nevertheless find it desirable and achievable even within the existing organizational structure.

3. The Inventory: We see numerous problems with the budget data presented in the document. The inventory of past and present activities is essentially a matrix, with expenditures catalogued by type of pollutant, by region, and by type of use. There is evidence of overlapping, double-counting, and gaps. Given the constraint of generating the data within the existing government cost-accounting system, and the probable absence of any specific procedures for cost-coding pollution expenditures in the past, these problems may not be correctable. We are disappointed by the failure to project expenditures beyond fiscal 1980. Most significant, however, is the decision to omit the activities of the non-Federal sector. The activities of the Federal sector cannot be intelligently planned without taking account of what has been done, and is planned by non-Federal entities. We recognize that the exclusion of non-Federal activities may have been required for purposes of this first draft due to time constraints. If this is the case, it would be better to relax those time constraints than to push forward with an incomplete and imperfect plan.

4. Output: While the document points up the need for data to be available in a timely fashion and in a form usable to all decision-makers, it appears to recommend only a first step towards this goal. A Federal data and information network should be viewed not only as a dispersing agency, but should also play an active role in collecting and assimilating information from all sectors. Such functions coupled with a regional distribution network should be a high national priority.

5. Funding: The document contends that the critical national needs in the area of ocean pollution can be met within the existing financial framework, and that significant additional funding is not immediately necessary. Although not labeled as such, this is both a conclusion and a recommendation; but it lacks substantiation. NACOA would suggest that in fact, a total expenditure of $155 million per annum seems modest, perhaps even insignificant, relative to most other indices of Federal activity. It seems clear that no useful judgement can be made about the proper level of future funding until the task at hand is better defined.

NACOA would welcome the opportunity to comment upon the next draft of this document, and is prepared to work closely with NOAA in the further development of the final Plan.

Sincerely,

Evelyn F. Murphy
SM Evelyn F. Murphy
Acting Chairperson

NATIONAL FISHERIES INSTITUTE, INC.

1101 CONNECTICUT AVENUE, N.W. ■ WASHINGTON, D.C. 20036 ■ (202) 857-1110

May 2, 1979

Mr. Lowell Martin
National Oceanic and
Atmospheric Administration
Room 927
6010 Executive Boulevard
Rockville, MD 20852

Dear Lowell:

Thank you for the opportunity to comment on your first draft of the Federal Plan for Ocean Pollution Research, Development, and Monitoring, 1979-83. The National Fisheries Institute representing more than 800 members engaged in all aspects of processing and marketing seafoods wishes to express their concern about the following sections of the draft report.

1. Page I-11. We do not believe that fish and shellfish processing, hatcheries, and aquaculture should be given medium priority. This aspect should be given low priority since returning processing waste to the marine environment is considered, by those most knowledgeable in this area, merely additional food for other marine life. The only exception being in an area of inadequate tidal flush, of which Alaska has several. The living marine resources panel also reflected this opinion in their report. On pages III-22 and 31, you also have given low priority to this subject.

2. Page II-31. Unless it can be specifically documented, we cannot agree that wastes from fish processing operations are causing local concerns in the North Atlantic Region. We have been very active in this entire area of pollution concerns and never to our knowledge have we had a problem arise in the North Atlantic Region. Be specific with data or delete that reference.

3. Page II-36. In view of the Congressional Mandate that municipal ocean dumping end soon, we question why, under Point 5, that high priority be given to evaluating the extent to which sewage and other materials can be disposed in open water etc. With the end of such dump-

ing in sight, I do not believe that we should be encouraging future possibilities of starting it again.

4. Page II-58. The fourth paragraph should be broadened to explain the Alaska situation with regard to inadequate flush in certain specific areas. All of Alaskan waters do not fall in this category and that should be clarified in that paragraph.

5. Page II-115. Living resources, (see comments under No. 1 above). We would also refer you to Dr. D. F. Soule's work at the University of California and her studies concerning fish processing wastes off the coast of California and the "no effect results" of her research. What would be more significant is a research need that would examine fish processing waste for any usable by-products that man could convert and use.

6. Page III-23. Disease Transmission. Fish Processing waste is fresh in nature and does not act as a carrier of disease back into the environment. The disease aspect comes from municipal wastes that are bioaccumulated in some species of shellfish. It would be our recommendation that item 3 on page III-23 be deleted.

7. Page III-31. As discussed above, delete reference in No. 7 to fish processing effluents.

Lowell, again many thanks for being able to participate. I will not be able to attend your meeting of the 14th since that date falls across our National Convention and I will be in Atlanta.

If you should have any questions or need additional assistance from the Institute, please do not hesitate to contact us.

Best Regards,

Roy Martin

Roy E. Martin, Director
Science and Technology

REM/bet

NATIONAL OCEAN INDUSTRIES ASSOCIATION
1100 Seventeenth Street, N.W. Washington, D.C. 20036

(202) 785-5116

May 14, 1979

Mr. James P. Walsh, Deputy Administrator
Chairman, Interagency Committee on Ocean Pollution
National Oceanic and Atmospheric Administration
U.S. Department of Commerce
Washington, D.C. 20230

Dear Bud:

In mid-April, you wrote to Mr. Charles Matthews, President of NOIA, to ask that NOIA assist in reviewing the five-year plan for ocean pollution research and development and monitoring being prepared for submission to the President and the Congress as required by the National Ocean Pollution Research and Development and Monitoring Planning Act of 1978. On behalf of our nearly 400 member companies whose businesses are all vitally affected by the protection and development of various ocean resources, we are pleased to have the opportunity to provide comments and hopefully constructive criticism based on our review of the draft provided by the Interagency Committee. We suggest that all comments you receive from various sources should be included as an appendix or addendum to the final plan, to set the final presentation in a context which most clearly shows the scope of participation and interest behind the plan.

The comments below are in essence general criticisms of the whole study, rather than a finely detailed review of every line of the draft, since we assume that the final product will undergo general and editorial revision before it is released to the President and the Congress.

The most elementary criticism NOIA directs at the plan stems from the Act which requires development of the plan. The criticism is that the plan, and the Act, ignore the tremendous amount of research and related activity which is not done by the Federal government. An assortment of State and private institutions, as well as many companies involved in ocean-related industry, conduct a great deal of research which does not need to be duplicated by Federal efforts. Why should the Federal government "reinvent the wheel" when so much valuable information already exists from sources outside the Federal government? This study and resulting plan would make a great deal more sense in terms of supporting rational decisions about future "R & D & M" if it took into consideration the activities of non-Federal entities. To disregard and possibly duplicate past and current non-Federal activity is illogical and inefficient. The draft makes passing reference to this major shortcoming, but does not conclude that any specific improvement is desirable. One of our member companies, Ocean Drilling and Exploration Company of New Orleans, has sent us a letter describing a specific case where Federal "R & D & M" would be a substantial waste of time and money, as a good example of the sort of difficulty arising from the limitation on the scope of the inventory to "Federal" efforts only. That letter is enclosed for your information.

The second general criticism we offer is that parts of the draft plan seem to be written with a view to justifying the continuation of existing programs, or the creation of new programs, with consideration of actual needs for research and development and monitoring taking the "back seat" to the justification for "survival" of programs or entities within the government. We do firmly believe that much research and greater understanding is needed as development of ocean resources progresses, but we have real doubts about the value the public may receive for its tax dollars if the plan for future activity is weighted too strongly toward areas of research where much is already known, or if areas are stressed merely because they are politically attractive. For example, throughout the draft, there is a heavy emphasis on "R & D & M" related to OCS mineral resource development, but various Federal and non-Federal entities have already done a great deal in this area, so that overly elementary studies in many cases would be duplicative and thus wasteful. By the same token, pollution of the oceans by oil is admittedly ugly, but experience over the last several years has demonstrated that actual long-term harm to the ocean environment from oil is relatively slight. Still, dollars for "study of the problem" are very much weighted toward this "problem," when the same dollars might serve the public and the environment much more effectively if dedicated to consideration of non-oil pollutants such as toxic chemicals and nuclear wastes.

Thank you for the opportunity to review and comment on the draft five-year plan. If we may be of further assistance, please call on us.

Sincerely,

Richard A. Legatski
Staff Counsel

Enclosure: ODECO Letter of May 4, 1979
cc: Mr. J.R. Macgregor, ODECO

RAL/bst

TELEX: 58-4124
PHONE: 504-561-2811

ODECO

**Ocean Drilling &
Exploration Company**

ODECO BUILDING: 1600 CANAL STREET P. O. BOX 61780, NEW ORLEANS, LA. 70161

May 4, 1979

National Ocean Industries Association
1100 Seventeenth St., N.W
Washington, D.C. 20036

Attention: Mr. Richard A. Legatski
Staff Counsel

RE: Draft "5 year Plan" for Federal Ocean
Pollution Research & Development & Monitoring

Gentlemen:

This refers to your memo of April 30th to members of the NOIA Environmental Protection Committee, with its attached copy of subject report.

I have reviewed this report as you requested and can offer only one suggestion.

On Page I-3, the report states: "In addition, no attempt was made during this first plan to inventory ocean pollution-related efforts which are funded by....private institutions, industry or interest groups which do or could provide information to the Federal government". On Page II-2, it states in part: "Federal research and monitoring programs can be described in two broad categories. These are (1) generic studies which collect baseline data...". On Page II-44, item (b)(2) states, in part: "Thorough chemical, biochemical and geological analyses are needed for historical ecological comparisons." Finally, Page III-27, under Gulf of Mexico Region, item (2), it states, as an item of "medium" priority: "Determine the long term effects of petroleum development on living resources and offshore and nearshore environments in order to facilitate historical ecological comparisons."

I submit that the "Plan" should give priority to preparing an inventory of studies made by "private institutions, industry or interest groups". Such an inventory could save many thousands of dollars of taxpayers' money by revealing the existence of studies already completed along the lines planned by the report.

A good example of this was the comprehensive study made by the Gulf Universities Research Consortium (GURC) in the Gulf of Mexico several years ago. The attached summary of this study will indicate to you that it should obviate the need for the Federal government to spend more money on a similar study. I would be surprised if other, similar studies in other areas off our U.S. shorelines have not been made and are free for the asking.

I have no other comments or recommendations to make.

Yours very truly,

J. R. Macgregor
Vice President
Environment & Governmental Affairs

JRM/bg
Attachment

cc: Mr. Willard Young
Manager-Environmental Affairs
Texas Eastern Transmission Co.
P. O.Box 2521
Houston, Texas 77001

NATIONAL OCEAN INDUSTRIES ASSOCIATION
1100 Seventeenth Street, N.W. Washington, D.C. 20036

(202) 785-5116

May 14, 1979

Mr. James P. Walsh, Deputy Administrator
Chairman, Interagency Committee on Ocean Pollution
National Oceanic and Atmospheric Administration
U.S. Department of Commerce
Washington, D.C. 20230

Dear Bud:

After the letter setting out NOIA's comments on the draft five-year plan was prepared, comments from another of our members raised an additional point on which we request the committee's consideration. Please accept this letter as a supplement to our previous comments.

Mr. W. Borden Wallace, of Wallace Menhaden Products, Inc., of New Orleans, has asked that we note that it is not necessarily true in every case that substances artificially introduced into the ocean will cause "harm" to the ocean environment. Some substances are at least arguably beneficial. For example, processed fish wastes can provide a significant nutrient base for enhanced development of desirable fish. Commercial fish and shellfish production has declined substantially in certain instances, following the curtailment or elimination of deposit of fish processing wastes in the receiving waters concerned. In the view of certain commercial fishing interests in particular, it would be wasteful and "harmful" to prohibit introduction of these wastes, where continued "disposal" in the manner described can promote growth of usable fishes.

The same basic point could be applied to what appears to be an assumed premise of the entire draft five-year plan. That is, it appears throughout the draft that the drafters assume that all substances artificially introduced into the marine environment are automatically "bad" or "harmful". There is a good case to be made that this premise is not valid. Several types of situation have been documented where addition of a substance did not cause any harm, and may in fact have enhanced the quality of the receiving waters.

Thank you again for the opportunity to comment on the draft.

Sincerely,

Richard A. Legatski
Staff Counsel

RAL/sb
cc: Mr. Wallace

National Wildlife Federation

1412 16TH ST., N.W., WASHINGTON, D.C. 20036 202—797-6800

July 17, 1979

James P. Walsh, Deputy Administrator
National Oceanic & Atmospheric Administration
Department of Commerce
Washington, D.C. 20230

Re: NWF Comments on Federal Ocean Plan

Dear Bud:

The attached comments represent the National Wildlife Federation's initial reactions to the April 1979 Draft of the "Federal Plan for Ocean Pollution Research, Development, and Monitoring, 1979-83."

While the tone and thrust of our comments may be critical (hopefully constructively so), we think the basic form and framework of the Plan is sound. Certainly, NOAA is to be commended for pulling it all together--a task which I'm sure was difficult and probably thankless.

I hope and trust that NOAA and the other agencies involved won't take to long resting on their laurels once the present Plan is completed. It can never be too early to begin work on the next "edition" of the Plan which should be designed to be an even better and more useful document.

Sincerely,

Kenneth S Kamlet

Kenneth S. Kamlet
Counsel

KSK:ks

cc: Lowell Martin, NOAA, Rockville, Md.

COMMENTS ON FIRST DRAFT FEDERAL PLAN FOR OCEAN POLLUTION RESEARCH, DEVELOPMENT AND MONITORING, 1979-83

APRIL 1979

General Comments

1. We regard as regrettable the fact that NOAA lacked sufficient pride of authorship of the Plan to include itself as an author. While the device of an Interagency Committee was undoubtedly useful in securing agency coordination and cooperation, committee efforts can go only so far. P.L. 95-273 intended for NOAA to play a lead role. By contrast, NOAA seems to have bent over backwards to avoid taking the lead -- or at least giving the appearance of taking the lead.

2. The draft plan does not appear to have taken account of the findings and conclusions of the Task Force on Goals and Objectives, set up under Section 202 of the MPRSA (Dr. Gerald Posner convened this effort).

3. It was unfortunate that the Draft Plan lacked a "Recommendations" section for us and others to review. (We recognize the severe time constraints under which NOAA operated).

4. The Draft indicates that the plan "does not attempt to resolve the conflicts "among developmental, environmental, and economic pressures. (pp. I-1 - I-2). This is unfortunate. We think resolving conflicts was an important objective of P.L. 95-273.

5. The Draft indicates that more than one-half of the overall Federal effort is directed toward petroleum-related activities. (p. I-5). This seems excessive. The Plan should recommend a close re-evaluation of the need for this much effort -- in terms of its productivity -- especially the BLM program of baseline studies in connection with OCS development. Our impression is that huge quantities of data have not been (and inherently cannot be) put to very good use.

6. We take issue with the Plan's conclusion that industrial waste disposal deserves highest priority while ocean dumping of dredged material is only a medium priority item. (pp. I-11 - I-12). This is so, in large part, because most industrial waste dumping is being phased out, while highly contaminated dredge spoils will continue to be ocean-dumped on into the indefinite future. (Ocean outfall discharge of industrial wastes, as distinct from ocean dumping, perhaps does deserve high-priority status).

7. The Draft Plan indicates (p. I-13) that the Interagency Committee will develop an initial set of goals for the first five-year Program. We believe NOAA should bear greater responsibility for this.

8. We are sorry that we did not have a copy of the thousand agency research activities, describing specific research activities, to review in evaluating the Plan. The adequacy of existing research efforts depends on specific activities, and cannot be assessed from generalized summary statements.

9. The draft indicates (p. II-3, II-4) that only how the existing Federal program addresses various pollutants is discussed and not what further work may be necessary. However, as we read the law -- and as we perceive the real need -- it is precisely a discussion of further research needs that is required.

Pollutants of Concern

1. p. II-6: $22.7 million for petroleum-related baseline studies seems excessive in light of the low utility of the data obtained and the follow-up work conducted.

2. The discussion of halogenated organics greatly understates the risks they pose. (p. II-8).

3. The reference to metal contamination of marine organisms states that these instances were "generally quite localized and occured near the point source inputs." (p. II-13). In fact, insufficient monitoring and analysis has been done to say, one way or the other.

Regional Efforts

1. Reference to the decline in ocean dumping activities in the Gulf (p. II-48) is true only if dredge spoil dumping is excluded.

2. Further study of dredge spoil ocean dumping should be a recommended goal in almost every regional area addressed.

3. The statement (II-66) that "there appears to be adequate support for monitoring pollutants in the Great Lakes" is debatable. A lot of data collection is going on, but much of this is unproductive. The major need is for toxicity testing -- both pre- and post-discharge.

Sources of Pollution

1. The reference to "Pollutant Movement and Alteration" (p. II-75) unjustifiably ignores "biological processes" which disperse, concentrate, and cycle municipal waste pollutants in the ocean.

2. The reference to "sediments" (p. II-76) misstates or fails to state the real needs. For example, more important that determining the "pollution content" of sediments is the need to assess the associated toxicity and potential for bioaccumulation.

3. The report (correctly) notes that no programs were reported for monitoring industrial wastes discharged at ocean outfalls. (p. II-82) Such studies should be recommended as a high-priority item.

4. The Corps program dealing with dredged material research is described as a $15M effort. We believe, in fact, that it was a $30M effort.

5. The Plan discusses the need for disposal site monitoring (p. II-84) and correctly notes that the Ocean Dumping Regulations require monitoring of existing and new ocean disposal sites.

However, it then implicitly assumes that such monitoring is, in fact, taking place. This is not the case. Of 140 presently (interim-approved) ocean dumpsites, only 26 are in the process of being studied in the next 2 1/2 years. The Plan should give a high priority to expeditiously completing site studies that are not only mandated by regulation, but also by statute (the Marine Protection, Research, and Sanctuaries Act), and by the London Ocean Dumping Convention.

6. The discussion of present dredged material disposal impact monitoring activities (pp. II-84 - II-85) indicates, but does not highlight, the fact that almost all of these activities were conducted in inland or estuarine, but not ocean waters. The "Analysis" that follows recommends that "these monitoring programs should be continued". (p. II-85). We suggest that this recommendation should be revised to encouraged further ocean-based research and monitoring.

7. The discussion of "High-Level Radioactive Wastes" in terms of needs (p. II-86) should emphasize the need for comparative evaluations of Rad waste emplacement methods on land versus the ocean.

8. It is far from clear that less rather than more research is needed into effects of brine disposal in connection with the Strategic Petroleum Reserve Program (see, p. II-107).

9. The discussion of "Marine Transportation" -- particularly "emergency cargo transfer systems" -- should address on-shore facilities for receiving and processing hazardous wastes removed from crippled vessels (e.g., Italian vessel carrying organophosphate pesticide).

10. The Draft Plan describes (at II-122) as "very desirable" increased research into the use of chemicals to be sprayed on beaches to make sand less permeable. Such an approach is almost certainly foredoomed to failure and should be regarded as a very low priority item. If one succeeds in rendering sand impermeable to oil, one will probably render them impermeable to the air and water needed by burrowing organisms to survive.

Impact on Health, Living Resources and Recreation

Deserves more emphasis. (pp. II-129-132).

National Needs

1. We strongly disagree with the assumption that present monitoring efforts regarding marine pollution are "responsive to the most critical needs" (p. III-5) or that they are adequately protective of human health.

2. Under "Needs," bioassays are needed, not only for "complex mixes" of pollutants in general, (p. III-9), but also for contaminated bottom sediments in particular. The "feasibility" of using biological organisms as indicators of pollution is not in doubt, it is an established fact. (p. III-9) Much greater reliance on bioassay testing is needed.

3. The same comment applies to Item 4 on p. III-18.

Summary of Needs and Priorities

1. The Draft gives a low priority (correctly to pharmaceutical waste dumping off Puerto Rico (which is due to be phased-out shortly). (p. III-27) However, the Draft later cites the Puerto Rico situation as justification for giving the study of industrial bioactive compounds a high priority. (p. III-36). These findings seem hard to reconcile.

2. Both the ecological impact of dredged materials dumping and disposal site monitoring for dredged material should, in our view, be given high rather than low priority. (p. III-46)

3. Brine disposal in the Gulf of Mexico is given a low priority in the Draft. (p. III-49) Given the magnitude of the Strategic Petroleum Reserve Program, it seems to us that this activity deserves at least a medium priority.

Miscellaneous Comments

1. We believe that, in general, the Draft Plan fails to emphasize the critical need for early warning of marine pollution crises. Bioassay testing (both pre- and post-dumping), in-situ tests (e.g., using Biotal Ocean Monitors and "Mussel Watch" systems), bioaccumulation testing, etc., all require a much greater effort.

2. Similarly, the issue of food-chain contamination by toxic pollutants (notably synthetic organics) is given excessively short shrift in the Draft. Further research and monitoring in this area deserve a very high priority.

Kenneth S. Kamlet

Counsel

Preliminary Comments
# of the
Natural Resources Defense Counsel
on the
Federal Plan for
Ocean Pollution Research,
Development, and Monitoring,
1979-83 (First Draft April 1979)

May 14, 1979

Prepared by

Sarah Chasis
Peter Holmes
Natural Resources Defense
Council, Inc.
122 East 42nd Street
New York, New York 10017

The Natural Resources Defense Council, Inc. (NRDC) has been asked to provide the Interagency Committee on Ocean Pollution with its comments on the First Draft (April 1979) of the 5-Year Plan for Federal Ocean Pollution Research & Development & Monitoring. NRDC is a national environmental organization with a membership of over 40,000 which is dedicated to the wise use and protection of the nation's natural resources. NRDC has done extensive work in the area of ocean pollution. These efforts include work under the federal Coastal Zone Management Act, the Outer Continental Shelf Lands Act, the National Environmental Policy Act, and the Clean Water Act, directed to preventing alteration of valuable coastal and marine habitats, both onshore and offshore, and preventing the entrance of additional pollutants into marine and coastal waters.

Because we have been provided with an extremely brief period (2 weeks) for review of the draft Federal Plan, our comments are necessarily preliminary in nature and less detailed than we would like.

Before turning to our comments on the substance of the plan, NRDC would like to express its concern about the manner in which the Plan was developed and the procedures for public review. Two weeks is simply not sufficient time for adequate public review. Second, the working papers (prepared by the Subcommittees of the Interagency Committee) were not made available to the public reviewers despite the fact that these working papers appear to provide an important basis for the conclusions contained in the Plan itself. Finally, the Plan does not contain the recommendations of the Interagency Committee. Yet these recommendations represent perhaps the key section of the Plan, since they will have the greatest influence on the formulation of Congressional policy on this matter. In a real sense then a completed plan has not been given to the outside reviewers.

Following are NRDC's written comments on the Plan. They will be supplemented by our oral comments at the meeting on Monday, May 14.

General Comments

There is a basic assumption made throughout the plan that so long as there is a study being carried out which relates to an identified national need, that need is being adequately met. This is a dangerous and misleading assumption to make. As the National Academy of Sciences study found with the BLM Environmental Studies Program, substantial amounts of money may often be spent to address an area of national importance, without these funds being spent to produce useful and timely information. Analysis of the utility of the information generated in terms of its timeliness, relevance to known government decisions which will need to be made in the future, as well as its form, is a prerequisite to formulating an effective plan. It may be that this type of analysis simply will not be undertaken willingly by an Interagency Committee. However, this fact reflects unfavorably on the committee format chosen rather than on the value of the task.

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A second omission from the Plan is an analysis of whether the most suitable federal agency is conducting the relevant research. For example, does it make sense to have the Corps of Engineers doing the primary research on the effects of dredged spoil disposal when it so clearly has a vested interest in the results? The same question may be asked about BLM and the Environmental Studies Program. This issue should be explored in analyzing the adequacy of existing efforts.

A third general concern relates to the Plan's broad and seemingly unsupported conclusion that present funding levels are sufficient to satisfy national needs. There is no support given for this dramatic conclusion. Yet on its face, $155 million would appear to be a miniscule amount of money compared to the problems and values at stake. This is true even recognizing the fact that state and private research and development efforts have not been included.

Finally, it would be helpful if the Plan were to identify national needs and priorities along the following lines. First, those areas where additional generic "effects" type research is necessary (e.g., the chronic, sub-lethal effects of oil on various marine species). Second, those areas where the generic effects of a pollutant are known, but site-specific work is necessary to determine the actual effects of a proposed or existing pollutant. Third, those pollutants where the effects generically and/or site-specifically are known to be severe and adverse and where the primary emphasis should be on developing alternative technologies or siting approaches which would avoid the pollution altogether. Since such a small percentage of the research budget goes to development, there is a serious question as to whether in fact sufficient emphasis is being placed in this area.

Specific Comments

p. II-6 It is shocking that only 15 percent of the studies on petroleum and petroleum products have gone to study the effects of oil on biota. Perhaps this explains the serious lack of information on the chronic, longterm effects of oil on the marine environment. (See conclusion at II-5).

p. II-7 The fact that so little money has been spent on developing means of preventing spills from offshore oil facilities and from vessels or on the economic impact of OCS activities is extremely disturbing. Substantial emphasis needs to be placed on these issues in the future.

p. II-17 Again, it is startling that so little money is being spent on the "effects" of radionuclide uptake by marine biota.

p. II-18 Should so much of the research being done on habitat modification be conducted by the Corps of Engineers? This is the type of policy question which needs to be explored and has not been.

II-22 and 23
also II-92 NRDC has devoted substantial effort to reducing the impacts of power plants ~~in~~ on the coastal and marine environments. These impacts--both from thermal pollution and from the entrainment and impingement of fish eggs, larvae and juveniles--can be substantial. Yet only $700,000 is going into studies of the effects of thermal pollution on a national basis and less than $140,000 (a different figure is given later in the plan) is going into studies of entrainment and impingement. We strongly disagree with the conclusion at II-92 that this type of research should be low priority. In an area such as the Hudson River, for example, where there are several power plants on a critical stretch of the estuary withdrawing huge volumes of cooling water daily, EPA's and the NRC's research on the problem and sensible solutions is essential to the protection of an extremely important commercial and recreational fishery. Much of this research can be done on only a site-specific basis.

p. II-34 The serious diminution in certain studies of fish (such as the striped bass) in the Mid-Atlantic region should be pointed to as a regional problem.

p. II-35 Regional needs should be expanded to include the need to assess the problem of existing contamination of the marine and coastal environment with toxic pollutants (e.g. over 500,000 lbs. of PCBs in the Hudson River).

II-38 Just because there are some studies ongoing which address regional needs does not mean they are doing the job well. NRDC vehemently objects to this cavalier and unsubstantiated conclusion.

II-67 The discussion of coastal land use practices is good.

II-92 We strongly disagree with the recommendation that site-specific studies on entrainment and impingement be given low priority. The Clean Water Act Section 316(b) essentially requires these studies to be site-specific. Furthermore, conduct of these studies is essential if industry studies are to be properly analyzed.

II-100 Based on the previous discussion of oil studies, it is clear that one recommendation should be increased emphasis on generic "effects" studies, particularly chronic, longterm effects.

III-19 The quality assurance guidelines should also be applicable to private and state efforts which are to be relied on in federal decision-making.

III-20 Under Living Resources, we recommend adding:

> "Identify generic effects (including longterm, sublethal effects) of pollutants whose effects on biota are presently unknown.

III-24 Add to priorities for the Middle Atlantic the need for solutions to the Hudson River PCB contamination problem and the problem of entrainment and impingement of fish from the Hudson River estuary.

III-38 We strongly object to the low ranking for entrainment and impingement studies.

Conclusion

There are many areas where we simply do not have time to comment. The omission of discussion on any point therefore does not indicate acceptance of the point. We hope that we will be given more extensive and meaningful opportunity for comment in the future.

Additional Natural Resources Defense Council Comments on Marine Pollution Plan:

1. An important national/regional need exists for assessment of the impacts (including economic) of marine pollution (including habitat alteration) on commercial fishery resources. We feel that commercial fishery resources deserve the same level of attention as recreation.

We recommend a separate category "Food Production/ Economics". (See III-20)

2. Because the Plan recognizes the fact that land-based sources are primary sources of marine pollution, more emphasis of federal research should be placed on R & D related to coastal land use practices.

Public Law 95-273
95th Congress

An Act

May 8, 1978
[S. 1617]

To establish a program of ocean pollution research, development, and monitoring, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "National Ocean Pollution Research and Development and Monitoring Planning Act of 1978".

National Ocean Pollution Research and Development and Monitoring Planning Act of 1978.
33 USC 1701 note.

SEC. 2. FINDINGS AND PURPOSES.

33 USC 1701.

(a) Findings.—The Congress finds and declares the following:

(1) Man's activities in the marine environment can have a profound short-term and long-term impact on such environment and greatly affect ocean and coastal resources therein.

(2) There is a need to establish a comprehensive Federal plan for ocean pollution research and development and monitoring, with particular attention being given to the inputs, fates, and effects of pollutants in the marine environment.

(3) Man will increasingly be forced to rely on ocean and coastal resources as other resources are depleted. Our ability to protect, preserve, develop, and utilize these ocean and coastal resources is directly related to our understanding of the effects which ocean pollution has upon such resources.

(4) Numerous departments, agencies, and instrumentalities of the Federal Government sponsor, support, or fund activities relating to ocean pollution research and development and monitoring. However, such activities are often uncoordinated and can result in unnecessary duplication.

(5) Better planning and more effective use of available funds, personnel, vessels, facilities, and equipment is the key to effective Federal action regarding ocean pollution research and development and monitoring.

(b) Purposes.—It is therefore the purpose of the Congress in this Act—

(1) to establish a comprehensive 5-year plan for Federal ocean pollution research and development and monitoring programs in order to provide planning for, coordination of, and dissemination of information with respect to such programs within the Federal Government;

(2) to develop the necessary base of information to support, and to provide for, the rational, efficient, and equitable utilization, conservation, and development of ocean and coastal resources; and

(3) to designate the National Oceanic and Atmospheric Administration as the lead Federal agency for preparing the plan referred to in paragraph (1) and to require the Administration to carry out a comprehensive program of ocean pollution research and development and monitoring under the plan.

SEC. 3. DEFINITIONS.

33 USC 1702.

As used in this Act, unless the context otherwise requires—

(1) The term "Administration" means the National Oceanic and Atmospheric Administration.

(2) The term "Administrator" means the Administrator of the Administration.

(3) The term "Director" means the Director of the Office of Science and Technology Policy in the Executive Office of the President.

(4) The term "marine environment" means the coastal zone (as defined in section 304(1) of the Coastal Zone Management Act of 1972 (16 U.S.C. 1453(1))); the seabed, subsoil, and waters of the territorial sea of the United States; the waters of any zone over which the United States asserts exclusive fishery management authority; the waters of the high seas; and the seabed and subsoil of and beyond the Outer Continental Shelf.

(5) The term "ocean and coastal resource" has the same meaning as is given such term in section 203(7) of the National Sea Grant Program Act (33 U.S.C. 1122(7)).

(6) The term "ocean pollution" means any short-term or long-term change in the marine environment.

SEC. 4. COMPREHENSIVE FEDERAL PLAN RELATING TO OCEAN POLLUTION.

33 USC 1703.

Responsibility.

(a) Lead Agency for Plan.—The Administrator, in consultation with the Director and other appropriate Federal officials having authority over ocean pollution research and development and monitoring programs, shall prepare, in accordance with this section, a comprehensive 5-year plan (hereinafter in this Act referred to as the "Plan") for the overall Federal effort in ocean pollution research and development and monitoring. The Plan shall be prepared and submitted to Congress and the President on or before February 15, 1979, and a revision of the Plan shall be prepared and so submitted by February 15 of each odd-numbered year occurring after 1979.

Submittal to President and Congress.

(b) Content of Plan.—The Plan shall contain, but need not be limited to, the following elements:

National priorities.

(1) Assessment and ordering of national needs and problems.—The Plan shall—

(A) identify those national needs and problems, which relate to specific aspects of ocean pollution (including, but not limited to, the effects of ocean pollution on the economic, social, and environmental values of ocean and coastal resources), which exist and will arise during the Plan period;

(B) establish the priority, based upon the value and cost of information which can be obtained from specific ocean pollution research and development and monitoring programs and projects, in which such needs should be met, and such problems should be solved, during the Plan period; and

(C) contain, if pursuant to the preparation of any revision of the Plan required under subsection (a) it is determined that any national need or problem or priority set forth in the preceding version of the Plan should be changed, a detailed explanation of the reasons for the change.

Existing Federal capability.

(2) Existing federal capability.—The Plan shall contain—

(A) a detailed listing of all existing Federal programs relating to ocean pollution research and development and monitoring (including, but not limited to, general research on marine ecosystems), which listing shall include, with respect to each such program—

(i) a catalogue of the Federal personnel, facilities, vessels and other equipment currently assigned to, or used for, the program, and

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(ii) a detailed description of the existing goals and costs of the program, including, but not limited to, a categorical breakdown of the funds currently being expended, and planned to be expended, to conduct the program; and

(B) an analysis of the extent to which each such program, if continued on the basis and at the funding level described pursuant to subparagraph (A)(ii), will assist in meeting the priorities set forth pursuant to paragraph (1)(B) during the Plan period.

(3) POLICY RECOMMENDATIONS.—If it is determined, as a result of the analysis required to be made under paragraph (2)(B), that the priorities set forth pursuant to paragraph (1)(B) will not be adequately met during the Plan period using the existing Federal capability described pursuant to paragraph (2)(A), the Plan shall contain those recommendations for changes in the overall Federal effort in ocean pollution research and development and monitoring which would ensure that those priorities are adequately met during the Plan period. Such recommendations may include, but need not be limited to—

(A) changes in the goals to be achieved under various existing Federal ocean pollution research and development and monitoring programs;

(B) suggested increases and decreases in the funding for any such existing program consistent with the extent to which such program contributes to the meeting of such priorities;

(C) specific proposals for interagency cooperation in cases in which the pooling of the resources of two or more Federal departments. agencies, or instrumentalities under existing programs could further efforts to meet such priorities or would eliminate duplication of effort; and

(D) suggested legislation to establish new Federal programs considered to be necessary if such priorities are to be met.

Budget review.

(4) BUDGET REVIEW.—The Plan shall contain a description of actions taken by the Administrator and the Director to coordinate the budget review process for the purpose of ensuring interagency coordination and cooperation in (A) the carrying out of Federal ocean pollution research and development and monitoring programs; and (B) eliminating unnecessary duplication of effort among such programs.

"Plan Period."

(c) For purposes of this section, the term "Plan period" means—

(1) with respect to the Plan as required to be submitted on February 15, 1979, the period of 5 fiscal years beginning on October 1, 1978; and

(2) with respect to each revision of the Plan, the period of 5 fiscal years beginning on October 1 of the year before the year in which the revision is required to be prepared under subsection (a).

33 USC 1704.

SEC. 5. COMPREHENSIVE OCEAN POLLUTION PROGRAM IN THE ADMINISTRATION.

Establishment.

(a) ESTABLISHMENT OF PROGRAM.—The Administrator shall establish within the Administration a comprehensive, coordinated, and effective ocean pollution research and development and monitoring program. The Administrator shall carry out all projects and activities under the program in a manner consistent with the Plan.

(b) Content of the Program.—The program required to be established under subsection (a) shall include, but not be limited to—

(1) all projects and activities relating to ocean pollution research and development and monitoring for which the Administrator has responsibility under provisions of law (including, but not limited to, title II of the Marine Protection, Research, and Sanctuaries Act of 1972 (33 U.S.C. 1441-1444)) other than paragraph (2);

(2) such projects and activities addressed to the priorities set forth in the Plan pursuant to section 4(b)(1)(B) that can be appropriately conducted within the Administration; and

(3) the provision of financial assistance under section 6.

SEC. 6. FINANCIAL ASSISTANCE.

33 USC 1705.

Grants and contracts.

(a) Grants and Contracts.—The Administrator may provide financial assistance in the form of grants or contracts for research and development and monitoring projects or activities which are needed to meet priorities set forth in the Plan pursuant to section 4(b)(1)(B), if such priorities are not being adequately addressed by any Federal department, agency, or instrumentality.

(b) Applications for Assistance.—Any person, including institutions of higher education and departments, agencies, and instrumentalities of the Federal Government or of any State or political subdivision thereof, may apply for financial assistance under this section for the conduct of projects and activities described in subsection (a), and, in addition, specific proposals may be invited. Each application for financial assistance shall be made in writing in such form and manner, and contain such information, as the Administrator may require. The Administrator may enter into contracts under this section without regard to section 3709 of the Revised Statutes of the United States (41 U.S.C. 5).

Contract authority.

(c) Existing Programs.—The projects and activities supported by grants or contracts made or entered into under this section shall, to the maximum extent practicable, be administered through existing Federal programs (including, but not limited to, the National Sea Grant Program) concerned with ocean pollution research and development and monitoring.

(d) Action by Administrator.—The Administrator shall act upon each application for a grant or contract under this section within six months after the date on which all required information is received by the Administrator from the applicant. Each grant made or contract entered into under this section shall be subject to such terms and conditions as the Secretary deems necessary in order to protect the interests of the United States. The total amount paid pursuant to any such grant or contract may, in the discretion of the Administrator, be up to 100 percent of the total cost of the project or activity involved.

Recordkeeping.

(e) Records.—Each recipient of financial assistance under this section shall keep such records as the Administrator shall prescribe, including records which fully disclose the amount and disposition by such recipient of the proceeds of such assistance, the total cost of the project or activity in connection with which such assistance was given or used, the amount of that portion of the cost of the project or activity which was supplied by other sources, and such other records as will facilitate an effective audit. Such records shall be maintained for three years after the completion of such project or activity. The Administrator and the Comptroller General of the United States, or any of their duly authorized representatives, shall have access, for the purpose of audit and examination, to any books, documents, papers, and

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records of receipts which, in the opinion of the Administrator or of the Comptroller General, may be related or pertinent to such financial assistance.

33 USC 1706.

SEC. 7. INTERAGENCY COOPERATION.

The head of each department, agency, or other instrumentality of the Federal Government which is engaged in or concerned with, or which has authority over, programs relating to ocean pollution research and development and monitoring—

(1) shall cooperate with the Administrator in carrying out the purposes of this Act;

(2) may, upon written request from the Administrator or Director, make available to the Administrator or Director, on a reimbursable basis or otherwise, such personnel (with their consent and without prejudice to their position and rating), services, or facilities as may be necessary to assist the Administrator or the Director to achieve the purposes of this Act; and

(3) shall, upon a written request from the Administrator or Director, furnish such data or other information as the Administrator or Director deems necessary to fulfill the purposes of this Act.

33 USC 1707.

SEC. 8. DISSEMINATION OF INFORMATION.

The Administrator shall ensure that the results, findings, and information regarding ocean pollution research and development and monitoring programs conducted or sponsored by the Federal Government be disseminated in a timely manner, and in useful forms, to relevant departments, agencies, and instrumentalities of the Federal Government, and to other persons having an interest in ocean pollution research and development and monitoring.

33 USC 1708.

SEC. 9. EFFECT ON OTHER LAWS.

Nothing in this Act shall be construed to amend, restrict, or otherwise alter the authority of any Federal department, agency, or instrumentality, under any law, to undertake research and development and monitoring relating to ocean pollution.

33 USC 1709.

SEC. 10. AUTHORIZATION OF APPROPRIATIONS.

There are authorized to be appropriated to the Administration for the purposes of carrying out this Act not to exceed $5,000,000 for the fiscal year ending September 30, 1979.

Approved May 8, 1978.

LEGISLATIVE HISTORY:

HOUSE REPORTS: No. 95-626 pt. 1 (Comm. on Science and Technology) and 95-626 pt. 2 (Comm. on Merchant Marine and Fisheries).
CONGRESSIONAL RECORD:
Vol. 123 (1977): Aug. 3, considered and passed Senate.
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